

# **The relationship between Open Source Software and Government Policy**

*Understanding commercial models and issues of  
sustainability for Open Source development in education*

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## **Executive Summary**

*"the great thing about open source is nobody owns it, a company like Oracle is free to take it for nothing, include it in our products and charge for support, and that's what we'll do. So it is not disruptive at all, you have to find places to add value. Once open source gets good enough, competing with it would be insane".*

Larry Ellison CEO Oracle, 18<sup>th</sup> April 2006, Financial Times

<http://news.ft.com/cms/s/5f7bdc18-ce85-11da-a032-0000779e2340.html>

1. Open Source Software (OSS) is currently the most significant issue related to global change and reform in the ICT industry. Virtually every major player in the industry has developed or is developing an OSS strategy.
2. OSS is a techno-social issue that has deep educational significance beyond the technologies themselves. Good educational practice will ensure that Open Source development is sustained by involving young people and their teachers in participative technological learning.
3. OSS development is highly congruent with the Government's stated e-strategy for schools. It complements policies including social inclusion, social enterprise, personal learning, vocational education, and citizenship.
4. Well-meaning initiatives such as e-Learning Credits damage the natural evolution to OSS infrastructure by killing the market incentives for change.
5. SF-UK, OSC and OFE are well-placed to support a progressive development of Open Source in support of Government policies and the e-strategy. There is the educational, technical, political and management expertise available to ensure success.
6. BECTA and the DfES are members of the Open Source community. Co-operation between Government, commercial and volunteer organisations within the umbrella of the OSS community, is a powerful public-private partnership waiting to be exploited by these stakeholders.
7. Getting from where we are to where we aspire to be requires clear leadership and a management that understands risk. Investment in a few key and strategic areas will yield new educational benefits as well as large future cost savings.
8. At the very least a high profile for OSS will promote increased competition that will force down prices and reduce the technological divide. There is huge scope to reduce costs and improve efficiency.
9. There is a window of opportunity for the UK Government to gain international recognition as a leader in technology reform. SF-UK, OSC and OFE have the global networks to ensure maximum positive publicity. As others realise the kudos of backing OSS strategies, the window of opportunity will close and the UK will be seen as a follower not a leader.
10. Principles of good education should drive any implementation strategy, increasing the scope for grass roots participation and the agenda for education reform, transforming learning.
11. A limited active OSS strategy is a research and development exercise to explore better and more efficient methods for public sector software procurement.

## **Introduction**

12. Open Source Software (OSS) continues to grow on a global scale<sup>1</sup>. There is no doubt that it has established itself as a long term, sustainable and important aspect of the global technological economy and for that reason alone it is relevant to education.
13. It's common for Open Source to be seen as a purely technical issue, driven by existing commercial imperatives when in fact it is a sociological revolution<sup>2</sup> that challenges accepted economic practice. Open Source has proved its power in influencing global standards e.g. Apache web server and Open Document (ISO 26300)<sup>3</sup>. It exists and thrives so there are clearly commercial models that work even if they are different from the more familiar paid for software license. The debate has shifted from "Is it sustainable?" to "How can we use it to best effect?"
14. This paper concentrates on the relevance of Open Source to the schools sector. In particular, the relevance of OSS to Government policy and strategy together with the practical methods for using OSS development to support transforming learning and bridging the digital divide<sup>4</sup>.
15. Commercial models for OSS are already sustainable in education but can be seriously inhibited or enhanced by Government intervention even in seemingly unrelated spheres. It is therefore vitally important that the OSS community, of which the Government is a member, works collaboratively to ensure that the fledgling software development environment for OSS applications in schools is appropriately supported when compared to the established closed source proprietary licensed sector. It's not a matter of complete polarisation of all one or all the other, it's about incremental management of change reflecting what is happening in the global technology industry.
16. A great deal of this is dependent on learning about the different ways in which the resources for development are made available and some immediate practical research and development is the sensible way forward. The good news is that the support required in order to achieve a significant impact is likely to be far, far less than the grants being provided for purchasing software licenses. The Open Source model is proving to be far more efficient than the systems it is replacing<sup>5</sup>.
17. The first part of the paper relates Government policy to Open Source communities and products; the second relates to responses to the seminar agenda and the third summarises the action needed to provide appropriate leadership in the management of change.

## **Government policy**

18. Government education policy<sup>6</sup> is extensive and complex but we can pick out some key relevant themes:
19. Internationalism, Citizenship, Social Enterprise, Vocational Learning, Personalised Learning, Understanding Technology and the Environment.
20. The e-strategy "Harnessing Technology: Transforming learning and children's services" provides four key objectives.
  - transforming teaching, learning and child development, enabling children and learners of all ages to meet their highest expectations
  - connecting with hard-to-reach groups in new ways
  - opening up education to partnerships with other organisations
  - moving to a new level of efficiency and effectiveness in our delivery.
21. Open Source Software and the associated development communities are a largely untapped resource that is directly relevant to each of these objectives.
22. Taking each of the six priorities in turn:
  - an integrated on-line information service for **all** citizens
23. Social inclusion and equality of opportunity require universal access and that is the value proposition of both Open Standards and Open Source. Without Open Standards and Open Source infrastructure, the cost and complexity of providing on-line services will further entrench the technological divide.
  - integrated on-line personal support for children and learners
24. Integration is enabled by standards. Active support for fully open standards improves the chances that the fundamental infrastructure is freely accessible by anyone from anywhere. Active support for Open Source enables basic access without having to pay for software licenses which then allows more of the financially disenfranchised to participate. It is impossible to target every potentially disadvantaged group with subsidies. Far better to provide the basic tools free for everyone at low cost. This can be achieved since most of the development work has already been done.
  - a collaborative approach to transforming teaching and learning
25. Open Source communities are the epitome of the collaborative approach and directly complement "Third Sector" policy. They have the real practical potential and the track record to turn rhetoric about transforming learning into reality. It is not just about technology, there is relevance to participation for many subjects, from literacy and languages to business and enterprise. The principle of personal individual contributions to projects and peer support is deeply ingrained in the culture of Open Source development communities.

- a good quality training and support package for practitioners
26. The "Learning Through Participation" paradigm is inherent to the Open Source development method and the learning and support is personalised through community membership. Training is therefore implicit to participating in Open Source communities. Open Source communities already support personalised learning, it's nothing new to those that take part, young or old.
- a leadership and development package for organisational capability in ICT
27. Open Source communities have a proven track record in global leadership in technological change and capability. By involving people at grass roots level in the development of their own resources we make them less dependent and more capable. The principle does not need to stop at coding but involves marketing, content production, quality assurance and a whole range of useful skills and knowledge all in the context of social enterprise. This means that the methods can support most of the subjects in the school curriculum. SF-UK, OSC and OFE can help support the development of leadership through Open Source communities.
- a common digital infrastructure to support transformation and reform
28. A common digital infrastructure implies Open Standards if it is to be freely and fairly accessible and conform with e-gif<sup>7</sup> policy. Open Source communities have provided leadership in Open Standards through, for example, W3C<sup>8</sup> and ISO 26300<sup>3</sup>. Transformation and reform require doing things differently. If we don't change the methods we will not change the outcomes. That is just as true for resourcing software development and interoperability as it is for teaching methods.
29. Educational initiatives such as the Specialist Schools programme and City Academies<sup>9</sup> are central to the Government's strategy for education reform. These initiatives emphasise key educational dimensions that are thought to add value to a common base-line for statutory education. Specialist schools and Academies have a mandate to provide national leadership in their specialism but also in areas such as ICT and enterprise.
30. In a globalised economy, pupils need to be internationally aware. Some schools specialise in Modern Foreign Languages and all Specialist Schools and City Academies have a remit to promote internationalism. E-commerce and international trade have been revolutionised by the Internet and citizenship has become a new subject in its own right for all schools. So what would be better than involving pupils in international community projects that use Internet technology for global communications to promote citizenship?
31. Open Source communities are characterised by their international contributors and form a natural vehicle for international co-operation for community benefit directly complementary to the Citizenship strands in the statutory secondary curriculum, namely:
- knowledge and understanding about becoming an informed citizen

- developing skills of enquiry and communication
  - developing skills of participation and responsible action.
32. The definition of a good citizen in an Open Source Community is someone that gives as well as takes from the community. The benefit to the community is summed up by the phrase "Give a brick, get a house". Open source communities are examples of international, participative, social enterprise in action enabled by the Internet. Anyone is free to join in. The research evidence<sup>5</sup> shows that investment in Open Source is instrumental in moving to a new level of efficiency and effectiveness in our delivery and therefore directly contributes to a key objective in the e-strategy.
  33. Moreover, by participating in an Open Source project, a pupil is learning by creating something useful for the community. Apart from generating more motivation than working towards a purely theoretical end, this prepares the pupil for work in international co-operative environments where technological understanding is valued. This really is transformational learning for the 21st Century.
  34. Understanding has always been a more worthy educational aim than simply knowing<sup>10</sup> and in a world of rapid change, understanding is absolutely essential in preparing pupils for technological change. Open Source communities are personalised learning environments, effectively free international schools, where understanding is valued and effectiveness peer assessed on the value of the outcome. The very methods that led to the science that is at the heart of every developed economy in the world. The outcomes are directed by the interests of the individuals providing a dimension of badly needed curriculum flexibility in what is becoming and increasingly prescribed set of activities. It may be that as learning environments, Open Source communities are shown to be far more important than any products that come from them.
  35. Environmentally, the current cycle of refresh, throwing away around a million computers from schools every few years, is unsustainable<sup>11</sup>. Effectively, there is a commercial drive to obsolescence because every new machine sold results in the sale of an operating system and the specification of the hardware is determined by the design of the operating system. When 90% of the software applications require one operating system from a single source of supply, and it's the operating system rather than the applications that require the increased hardware specification, the scope for abuse of that monopoly position becomes irresistible<sup>12</sup>.
  36. Open Source software makes hardware longevity more likely because the development pressure is to improve the code, not to sell more licenses through forced upgrades linked to de facto standards. The forced upgrade model has had its day. The writing was on the wall as soon as internet based applications started to appear<sup>12.1</sup>. So any strengthening of the Open Source infrastructure is likely to result in environmental benefits. This is also true of the shifting paradigm, from the desktop PC as the platform for running applications, to the Open Internet which is recognised in the DfES e-strategy. Developing web applications is less expensive than developing for the desktop (except if rules for accessibility etc. are not equally applied), less complex and more sustainable. Strategies that accelerate the production of Internet-based applications and Open Source software are

likely to make a significant impact on environmental waste and are fully compatible with the DfES's e-strategy and environment policy. A school where 80% of the terminals are thin clients<sup>13</sup> will save thousands of pounds in electricity reducing carbon dioxide emissions. Thin clients will get greater take up if there are more Internet based applications developed to support learning. The situation just requires leadership to support open technological infrastructure and web based open applications to support learning.

## ***Social inclusion, equality of opportunity and the digital divide***

37. Social inclusion, equality of opportunity and bridging the digital divide are closely related. With the evidence that people are 8 times more likely to use a home internet connection than one in their place of education<sup>14</sup> and that social classes A/B have approximately 3 times as many Internet users as social classes D/E, the digital divide is still a considerable problem.
38. Inclusion starts with access but also depends on expertise. Access means a connection and terminal and the immediate availability of appropriately organised resources together with the levels of literacy and technical skills to make use of them. The more ubiquitous access is, the less likely anyone will be excluded. Achieving universal access to 90% of applications is more inclusive than giving 60% of the population access to 100% of the applications. For this reason there should be a shift from seeing innovation as cutting edge and expensive technologies to an emphasis on innovation as getting universal take up of the most commonly used applications. This does not mean no use of cutting edge technologies, it means that the priority simply shifts from the technology itself to the social impact on people.
39. In many cases where there is danger of exclusion or inequality, Government intervention takes place, whether through legislation, regulation, or funding specific projects. Ironically, some well-intentioned projects have exactly the opposite effect than intended. Supplying a limited number of people with government subsidised resources that have no particular manufacturing costs in a sector that would not have bought them otherwise, is great business for companies that make their money from selling software licences. It is a disaster for the commercial Open Source sector and does nothing to tackle the longer term root problem, entrenching current de facto standards and ensuring the universal adoption of open standards is further delayed. This in turn delays bridging the digital divide.
40. Expertise and its uniformity is a significant factor in providing equality of opportunity to learners. If the teachers in one school are more expert at choosing software than those in another, some students are relatively disenfranchised compared to others. To an extent this is inevitable, the question is how to reduce the effect? If there was a freely accessible core of learning support materials that systematically covered the National Curriculum from 5-16 it would certainly diminish this effect and contribute to a fairer situation for learners.

41. Social inclusion requires very low cost or free access from home as well as school. Investment of public money needs to be better targeted on learning applications that run on standards compliant browsers on low cost terminals if social inclusion really is a high priority. Worry less about technically complex applications that require the latest expensive technology to which few people have access and more about simple and elegant learning solutions that require minimal resources. This will not happen without a serious shift in attitudes and the leadership needed to implement practical strategies for change.
42. In terms of the digital divide there are two clear options. Get the price of access down so that even the poorest can afford it or subsidise all/some of those who can't afford to participate. Open Source software provides an opportunity for fundamentally lowering costs, increasing the effective level of competition and motivating people to learn through active participation. On those grounds alone it makes sense to have a clear national strategy for Open Source software development as part of the wider strategy for social inclusion.

### ***Competition and the commercial market***

43. The Competition Commission is responsible for ensuring that competition is not "distorted, restricted or prevented" in any UK market for goods or services. It is complemented by the Office of Fair Trading which investigates issues related to cartels (Chapter I prohibitions) and abuse of a dominant market position (Chapter II prohibitions)<sup>17</sup>. There is a clear aim to ensure that there is healthy competition in markets and appropriate regulation where this can not be achieved.
44. In highly competitive commercial markets competition forces prices down and poor quality of service simply means the customer moves to another supplier. Regulation is used where monopoly supply is difficult to avoid, e.g. in the provision of education or commodities such as water or electricity. Efficient performance is not specifically driven by whether or not the organisation is in the public or private sector, it's usually a function of accountability. Private sector monopolies are primarily accountable to their shareholders for optimised profits and so the prime consideration will be to get the biggest possible return for shareholders spending the least possible on service to the customer. Competition is a prime driver of accountability to the customer, particularly in the private sector. It's therefore in any large customer's interest to stimulate increased competition in private sector markets where it is lacking.
45. It is in some ways surprising that the Competition Commission and the Office of Fair Trading have not acted with more vigour in the ICT industry given their activities with the utility companies. After all, operating system and general productivity software have become universal utility commodities<sup>18</sup> on which most people are dependent. Part of the reason at least is in the complexity not only of the technology but the way in which it is licensed and the fact that unlike the utility companies the ownership of the commodity originates outside the direct legislative scope of the Government. For these reasons, it is much more straightforward to adopt a strategy that avoids expensive legislation and regulatory bodies. Open Source software provides the means of devising such a strategy and the Open Source community has the knowledge and expertise to turn strategy

into effective practice at low cost.

## **The economics of Open Source development**

46. There are three key aspects to consider in the economics of software development. The first is the cost of developing the code, the second the degree to which the code developed is fit for purpose and the third the cost of getting people to use code. Software is fit for purpose if the investment in its production results in the intended outcomes. Value for money is achieved if the intended outcomes are fit for purpose in the eyes of the users and the development cost and distribution and marketing costs are as low as possible. To start with I will consider the commercial "licenses for sale" model followed by the Open Source model and then look at them in terms of the recent funding of education software applications by the DfES through Curriculum On-line.
47. Funding of development in the commercial licensed proprietary software arena is complex. "At risk" finance is used to develop code which is then promoted and if popular recoups the investment by selling licenses after the development has taken place. Often the main cost is marketing and promotion and quite often its the most heavily promoted application that wins out, not necessarily the best product. It is easy to see why much of the revenue from sales never finds its way back into development. In addition, revenue after development might simply be taken as profits. For an individual, buying a license has become the standard method of acquiring access to powerful software applications. However, this doesn't make much economic sense when equivalent tools are freely available and it makes even less sense for large organisations that end up paying more in license fees than the entire development cost of the software that they are using. Education is clearly a factor in achieving best
48. Open Source development is based on a different economic paradigm to commercially licensed proprietary software<sup>16</sup>. Understanding how it works is not intuitive, if it was, change would have happened a lot earlier. But many discoveries are non-intuitive. It was not intuitive to Galileo's contemporaries that all objects accelerate to earth at the same rate irrespective of their weight.

*"Discovery consists of looking at the same thing as everyone else and thinking something different."*

Albert Szent-Gyrgyi, Nobel Prize winner

49. The resources for Open Source development have to be available at the time the development takes place as with the previously described model but the motivation for development can't be predicated on selling licenses in the future. The traditional argument against direct funding of development is that it's too big a task for individuals and too big a risk for organisations. What if the software is badly received, goes over budget or is full of bugs? For sure, the risk is big if we assume we are dealing with a large monolithic project that is unlike anything that has gone before. In many cases, probably the majority, it does not have to be this way. In large applications such as OpenOffice.org, Moodle and Firefox, most of the work is already done so the risk of contributing relatively small extensions and incremental improvements is small and many people can share what risk

there is because anyone is free to contribute and there are still highly organised quality assurance procedures. For small applications such as software content supporting a particular learning objective, risk is minimal since the application is relatively simple and inherently low cost at the outset. So it is clearly possible to minimise the risk. Often the paid license model will present greater risk because the customer has to fit to the software and in the case of monopoly supply, pays highly for lock-in. Despite extensive safeguards and complex procurement procedures large closed source software projects, commissioned by Government, have a poor reputation in providing fitness for purpose or value for money.

50. Unlike many other products there are virtually no manufacture or distribution costs for software. Once the development is complete, allowing others to freely improve the resources at no cost to the tax payer is a much more efficient use of public funds for the public good. The DfES has inbuilt promotional channels removing much of the advertising cost of getting products to schools and there are additional benefits such as learning through participation that are of value even though difficult to quantify. As long as we are reasonably sure of what we want to achieve, direct funding of Open Source software is orders of magnitude less expensive than buying software licenses as we shall see later. This requires a fundamentally different attitude to funding software development. It does not mean that there is absolutely no place for commercially licensed proprietary software, but it does mean that fundamental changes in the management approach are needed. No innovation, no change, no reform.
51. Let's now look at a specific example. Take the recent funding for educational software development as an example. How much **new** software that is fit for purpose in terms of the e-strategy, has been generated by the investment of £330 million in Curriculum On-line?<sup>15</sup>
52. It seems that only a relatively small amount of the software available through Curriculum On-line complies fully with web based standards and much of it is nothing at all to do with on-line learning. On-line purchase perhaps but that seems a particularly unambitious goal in the context of building schools for the future. Fit for purpose? There is no coherent systematically organised support for what is a statutory curriculum getting on for 20 years old. What would a reasonable baseline for a fit for purpose on-line curriculum look like? Perhaps being able to go to any standards compliant web browser and obtain access to learning applications that give systematic and full coverage of the statutory curriculum with the resources matched to a range of learning needs. Indeed this too is a requirement for social and economic inclusion.
53. One would also expect ease of maintenance and ease of use to be fitness for purpose criteria for any software. So how easy is it for schools to try out Curriculum On-line software before buying it in order to ensure value for their money? Compare booking an airline ticket or ordering a book on the Internet with gaining access to learning resources for a primary school. First, order software, receive it, unpack it from its box, read a manual about the methods for installation and then install to maybe 100 individual machines each needing a different license key and a range of security issues. All this just to access one application which could turn out to be a lot less useful than first envisaged. If airlines can handle their

complex transactions through standards compliant browsers, is it too much to expect similar simplicity in access to learning resources? Clearly the cost of Curriculum On-Line software is a lot higher than just the license fees.

54. Its easy to find fault, but what of solutions? Take a reasonable cost of developing one hour of open source web based learning content at £1000 (figure is based on real experience so it is of the right order of magnitude) £500m would generate 500,000 hours of learning content all of which is free for re-use, modification and recombination. In a 11 year National Curriculum with 1000 hours of teaching per year that is 45 different possible strands of support for the entire curriculum from 5-16. Even if we were only 20% efficient it would still be 9 levels of differentiation for every single year in all the subjects. This demonstrates that Open Source development is at least an order of magnitude more efficient than the conventional paid for license method and possibly as high as two if we take into account that the software pool can be freely augmented with voluntary contributions and has virtually no installation or administrative overheads. After what will be a £500 million investment, the taxpayer is entitled to ask where the freely usable resources compliant with Open Standards are to be found. Where is the On-line curriculum on the National Grid for Learning?
55. If there was this volume of standards compliant learning content, that worked on any computer platform it would be usable on refurbished hardware running free software. That would directly contribute to bridging the digital divide by lowering the cost of access at the same time reducing environmental waste. More machines taken out of landfill and more terminals in schools and homes including more of those that are currently excluded.
56. While the DfES has ploughed hundreds of millions and perhaps billions over the years into the commercial license model, it has invested virtually nothing in the up and coming Open Source model, not even small amounts to specific projects for practical research and development. Since direct or indirect Government funding is what drives educational software development, it's rather unsurprising that the quantity of Open Source applications focussed on education is low. Is there to be critical and independent evaluation of the value for money provided by what will in the end be at least a half billion pound investment through Curriculum On-line? Or do we just assume that there is no other possible approach and just keep digging deeper and deeper?

## **Response to agenda items**

57. **How are SF-UK, OSC and OFE currently placed to support Open Source in schools?**
58. Answer - We already do so through the web sites, FLOSSIE conference, and support contracts in individual schools. The Open Source Consortium provides a co-operative of companies specifically set up to bid for Government tenders where Open Source solutions are appropriate. We have the management skills and knowledge to progressively develop the school focused Open Source communities described in this paper, into a sustainable and affordable reality. We have already started with initiatives such as the International Grades in Office Technology<sup>19</sup> where students can achieve L2 VRQ certification by making contributions through community participation. We need strong partnership with Government and its agencies to build on this to further the e-strategy to the fullest effect.
59. **Case studies at the current time?**
60. Please refer to the Schoolforge UK web site at [www.schoolforge.org.uk](http://www.schoolforge.org.uk)
61. **Gaps in Open Source support for the BECTA technical and functional specification.**
62. "1.2.2 Learners and educators shall have access to a wide range of on-line curriculum resources"
63. This is really the crux. We have already provided detailed comments on the BECTA infrastructure draft documents and mostly there is no big gap in Open Source infrastructural support in the way it is defined in these documents. However, the documents are so general that a lot is left to interpretation. How do we define "wide range"? Certainly, if on-line resources fully meet W3C<sup>8</sup> standards they will be accessible using Open Source applications. Where on-line resources do not conform to Open Standards or are written specifically for a proprietary browser or operating system that does not conform to Open Standards there is an increased likelihood that some or all aspects will not work reliably. This is also true of on-line assessment resources. If the design starts from the premise that it's dependent on some specific proprietary technology it's a fundamentally flawed development process from the outset. Were such considerations part of the risk analysis in the specification of the KS3 national tests? If not, they clearly should have been and if they were and someone has ignored the specification they should be held accountable. Members of SF-UK/OSC and OFE clearly have the experience and expertise to help avoid such mistakes in the future.
64. Instead of putting the onus on the Open Source community to identify and fill gaps it would be more productive to implement a strategy to ensure that all future applications developed directly or indirectly (licenses purchased) from public finances support open standards and work across platforms. This is no different in principle to requiring new buildings to have facilities for the disabled or meeting certain ISO standards. If any future direct public funding of new applications was conditional on the

resources being Open Source and able to run across at least GNU/Linux and Apple platforms as well as Windows, change towards Open Standards would accelerate. Making development funded by the public purse open for the benefit of all the taxpayers who paid for the development seems more than reasonable. The name, Curriculum On-Line, one would expect to mean web based resources not merely web based purchase. It might take time to get to this position but allowing the use of eLCs to purchase general software tools and content that is not fully open and does not have to conform to any accessibility constraints appears to be in direct conflict with the stated e-strategy. It entrenches the old technology making it more difficult to migrate to the new. It might not be possible in the first instance to sensibly spend £100m on web based applications and it is unnecessary to do so. Modest seed funding for Open Source projects in strategic areas will have the desired effect.

65. **How do open source companies make money?**

66. With great difficulty when DfES funding distorts the market by putting hundreds of millions into a competing commercial model and almost nothing into the Open Source development community model. Remember DfES funding drives software development for schools. The way in which it drives development is highly dependent on how Government makes the funding available. Apart from reinforcing closed de facto standards, current funding policies tend to shift investment away from local small businesses to large corporates and overseas supply. Exactly the opposite of Government policy for developing small businesses and local hi-tech growth.

67. Open Source companies make money<sup>16</sup> from services, support and from products associated with software. According to the large software companies, software licenses are a marginal cost in the total cost of ownership. The average spending on ICT in a secondary school in 2004 was £88,200. The cost of MS Schools Agreement<sup>12</sup>licenses for 1000 seats in a school of the future would alone be over a third of that expenditure before buying any educational application or other non-MS productivity tools, technical support, broadband subscriptions or hardware replacements. The Open Source view is that if software development is in the whole scheme of things a marginal cost, let's just absorb the cost into other services. In fact, software development costs are only a fraction of the buying price of licenses<sup>12,2</sup>so the development cost really is small if tackled sensibly - Typically 75% profit margins are made on MS Windows and MS Office so only 25% of the price is for development and other business expenses, in reality probably less than 5% for development when marketing, legal costs and subsidies of unprofitable business are taken into account. Compare the size of the development team of OpenOffice.org - around 80 developers, and Firefox - 20, with the 11 billion in revenue from MS Office in 2005. IBM, Sun, Google and Novell seem to have grasped this reality and virtually all the big industry players have Open Source strategies. It is the model of commercial software licensing that is unsustainable, not the Open Source model, particularly in schools where the need is 1:1 access. The e-strategy states that "moving to a new level of efficiency and effectiveness in our delivery" is a key objective. We have the intellectual capital to help the DfES to achieve a new level of efficiency and effectiveness on behalf of the taxpayer.

68. **Other than by direct funding how likely is it that Open Source development will thrive for key educational applications?**
69. What are the key educational applications? Moodle<sup>20</sup> thrives worldwide. It has 100,000 registered users on the main site, increasing daily and representing 150 countries and 70 languages. If you were looking for a global open standard for VLEs you would not have to look any further. Yet Moodle has a mountain to climb to get over BECTA's procurement requirements. Leicester LA recently singled out Moodle as something not to be used on the grounds of lack of support. The ignorance is astounding. The e-strategy talks about innovation. How likely is it that any real innovation will find its way into the classroom when the most innovative global technologies for education can't get past the gate-keepers because they require a different approach to procurement? Isn't that what innovation is all about? Doing things differently. "Do what you always did, get what you always got". Moodle is an opportunity for safe global leadership by the UK Government but it looks like it will be left for others in countries where value for money is a more pressing issue. Have we learnt nothing about the risks of allowing commercial software monopolies to establish themselves as a result of laissez-faire leadership?
70. There are relatively few Open Source educational applications specifically targeted on learning in the NC and that is unlikely to change while eLCs distort the market. What is the motivation for a large international company let alone a small UK Open Source company to compete with such a juggernaut? A large company like Sun will put development into OpenOffice.org<sup>21</sup> because it knows that investing in the community pays back indirect dividends to the company. Small amounts (compared to company turnover) of low risk funding strategically managed with the potential for a big effect. If the money that was going to be spent by their customers on competitors' software licenses is diverted into buying their products and services it's likely to outweigh the development cost of the software, particularly when they get free input from 35,000 community volunteers to help with marketing, language localisation and quality assurance. A public private sector partnership that draws genuine resource from the community. They also get a lot of positive publicity by being seen as altruistic, particularly in developing countries. It is really very surprising that the DfES doesn't see this because, on a government scale, the economics dwarf those for even a large multinational company. This is why leadership and vision are important. Talking the talk of innovation is easy, walking the walk is more of a challenge. If a large company's shareholders see Open Source as worth investment, Government should see that it's in the taxpayers interest to have a managed strategy for Open Source development.
71. While the status quo is maintained with Curriculum On-line funding at £100m per year supporting commercially licensed proprietary software with little or no Government support at all for Open Source development, don't expect much to change. The software that will be developed is more likely to come from more enlightened sources overseas but there is no guarantee this will fit the National Curriculum or even be in English. Rather ironic that it is likely to be the developing countries that cannot afford to waste money that will become the technological leaders in world education.

72. **How will the OS community ensure its products meet BECTA's standards for the National Digital Infrastructure?**
73. The Open Source Community is not some sort of commercial entity trying to sell products. BECTA and the DfES are themselves part of the community and the direction of development depends very much on the willingness of community interest groups to back their own interests directly. If you complain code doesn't do what you want, the usual reply is then fix it yourself or pay someone to fix it. You have the freedom to do it, so exercise that freedom and take responsibility for contributing to the community. Others are contributing for your benefit so you contribute in your areas of interest for theirs.
74. On what basis does BECTA establish its National Digital Infrastructure Standards? In general, if these are agreed international open standards, it's very likely that Open Source products will meet these standards since Open Source communities have in many cases led and championed the standards. If a product doesn't meet a standard and BECTA and/or the DfES thinks it should, as members of the community they are perfectly free to fix the problem or indeed commission someone to do so on their behalf, subject to competitive tendering. There would be no shortage of takers. That is far less expensive than being tied into a monopoly and reflects a true public/private sector partnership in that both public and private sectors, commercial and voluntary, are contributing to the resources that all use. Change is the name of the game and public sector procurement procedures and attitudes need to change as technology changes society and society changes technology. If this is going to work, thinking how accountability is exercised has to change too. The rhetoric of leadership, reform and change management has to be converted into practice. We have the expertise to support this process but we do not believe it can be our sole responsibility to drive it and resource it.
75. What are the key barriers to using Open Source Software to support learning and how can they be reduced or removed?
76. 1. Lack of leadership, 2. Lack of leadership 3. Lack of leadership.
77. Leadership<sup>22</sup> starts with understanding problems and potential solutions to problems and then uses this knowledge and understanding to instil confidence in others to follow. The entire IT industry is based on confidence. Consumer confidence in the IT industry (including those working in education) is derived from comfort and familiarity rather than on quality and competence. There has been long-term acceptance of high costs and low quality rather than a critical drive to reduce costs and increase quality.
78. The main starting point for de facto standards in microcomputers was IBM, the dominant force in global computing. They provided confidence in the industry through the IBM PC<sup>23</sup>. An open architecture backed by the biggest player in the market who actually thought microcomputers were not really very significant. (At the time components like processors and operating systems were not considered to be strategically important) This provided security and confidence. An expensive, monochrome, silent machine at a time when there were inexpensive, multi-screen mode, colour and polyphonic machines in abundance. This is the power of leadership in

establishing a national or international standard. Instilling confidence in the user base so that applications developers believe there is a sustainable market. This is the leadership challenge for governments with Open Source.

79. The fact is that for infrastructure, Open Source already has sustainable<sup>24</sup> momentum behind it worldwide, the internet is fundamentally dependent on Open Source software and governments from China to South America have taken action to promote its use<sup>25</sup>. It's more a matter of how quickly, rather than if, it will grow further. Globally, Open Source will continue to grow whatever action the UK Government takes. The DfES can either be seen as reactionary to technological change or it can embrace and accelerate it. A clear Government statement that Open Source development was high on its agenda backed by some modest but strategically significant public/private partnership projects will provide clear leadership that reinforces a range of Government policies. Initial projects can be modest but scalable in order to support change management, reduce risk and promote early success.
80. The main reason that people use Windows as an operating system is that they are confident that if they need a particular application they will be able to find one. If GNU/Linux ran all the same applications as Windows it is very unlikely that many people would pay £80 per license to use Windows and put up with the inconvenience of software license keys, viruses and spyware. So the fundamental issue is in getting more applications available that will run on GNU/Linux (if they run on Windows, Apple and other closed operating systems too it's no big issue, that just stimulates competition.) While eLCs pour a third of a billion into proprietary licensed software that is mainly targeted on Windows it's unrealistic to expect Open Source development to compete in any shape or form. If the Government is serious about opening up markets it has to stop digging the hole deeper and deeper and then wondering why daylight is disappearing.
- 81. What strategies might increase the take up of generic applications such as OpenOffice.org, Firefox and Moodle?**
82. Active leadership. Leadership can be positive or negative and at present a lot is negative as far as Open Source is concerned even if this is not the intention.
83. **OpenOffice.org.** There is now an ISO standard for electronic documents. ISO 26300 is Open Document Format and there are at least two comprehensive free editors for it, OpenOffice.org and Koffice. Already web based applications such as Google's Writely have appeared. ISO 26300 can serve a similar purpose to pdf but is much more versatile and fully open. The world would benefit from a compact Open Document reader because OpenOffice.org is a big download with about 3 times the data that is in the latest Acrobat Reader 7. Koffice is more compact but at present only works on GNU/Linux. There is a project proposal to develop a compact ODF reader at the Open Document Fellowship<sup>26</sup>. It is not a huge amount of work because a lot of the required code already exists. A public private partnership between the DfES and the Open Document Fellowship (or ODF Alliance) to produce such a reader would cost a few tens of thousands in government matched funding. (The community would donate

a lot more than 50% of the development costs). It would provide positive leadership in moving to less expensive software in the public sector even if only because of the effect on competition. Inexpensive, low risk but a practical means of improving value for money in the public sector that far outweighs the finance required.

84. Such a reader would support government departments in providing the leadership needed to establish Open Documents as the standard directly relevant to government <sup>7</sup> policy as well as social inclusion and bridging the digital divide. It would bring positive worldwide publicity at a time when it is in short supply. Wherever a Government department makes available a document for download use ISO 26300 and the reader with a note to say fully open and free editors are also available providing the appropriate links. It is a much more versatile format than pdf and pdf files can be created directly from it using OpenOffice.org. Stop putting things out in proprietary formats and provide links to the odf reader and odf editors. This then supports a fully open file format for both reading and editing documents with freely available tools for doing both. Use the Government's own e-gif policy as the rationale. Explain that the policy is to use fully open formats and ISO standards wherever reasonably possible, to promote interoperability for the common good. Recommend that schools and LAs download and install the free reader and editors and encourage their use. Expect some complaints and adverse reactions, it's all part of management of change, but expect a lot of praise too from the more technologically educated for providing positive and international leadership.
85. **Firefox.** This is to an extent an issue of accessibility. Apply rules and principles consistently and regularly publicise them. Insist that all DfES, suppliers to DfES, LA and school web sites conform to W3C standards and WCAG priority 1. (They should do by law in any case but re-iterating and publicising it will not do any harm) Apply the same principles of inclusion of minorities that are in force for people with disabilities to users of Open Source software. There are as many desktop GNU/Linux users worldwide as Mac users and they tend to be the people who can't afford Macs and Windows PCs, so it's a sizeable minority. If a site only works properly with Internet Explorer or some proprietary plug-ins, it's not going to be accessible by GNU/Linux users. So all educational web based resources should be capable of running on Linux through a standards compliant browser as well as being WCAG priority 2 compliant simply on the grounds that the GNU/Linux users are just as much a minority group as blind or deaf people. They are simply being economically disenfranchised rather than as a result of physical disability.
86. Rules for desktop applications should be the same as for web based applications. It makes no difference from a learner's point of view whether the application is delivered from the web or the desktop so there is no logic in having different accessibility rules for each. If there are more constraints on web based applications from this point of view, all you do is put another barrier in the way of migration to web based applications. Commission some Open Source examples of good practice to demonstrate applications that are open, well documented, run cross platform and support progression in the National Curriculum in primary schools. Using Firefox as the test standard will enable this. We can provide the expertise for such a project. We have expertise in Open Source project management,

education, coding and accessibility.

87. **Moodle.** Adoption of Moodle as a benchmark for VLEs really shouldn't cause a problem. It's already a credible global open standard. Make Moodle the national benchmark for VLEs and fund any development work required for it to meet the exact standards BECTA requires, including documentation and training materials. This gives a practical and concrete model for commercial suppliers to follow or indeed improve. Put the work out for competitive tender to ensure fairness and that the Moodle Benchmark is good enough for use in all schools. Allow any qualified person to bid for development work which will be released under the same Open Source license as Moodle. This is a matched funded project with the community providing 95% of the resource and DfES 5% since any modification funded by the DfES are going to be small compared with what has already been developed by the volunteer supporters.
88. Allow any commercial VLE to be used by schools and RBCs but insist that it must stand comparison with Moodle as the benchmark and it must interoperate with Moodle reliably. Since Moodle is Open Source and already well-developed, anyone can contribute to its further development without any fear of lock-in to a single commercial interest.
89. Divide work into small manageable low risk packages so there is no need for huge and complex tendering procedures. If the commissioned company fails to deliver another can simply take over, if work is unsatisfactory don't pay. Encourage individuals and small companies to bid. This will keep the development price down because small players have lower overheads and will almost certainly be a lot less expensive than the large operators. All that matters is that the code and documentation are delivered - don't pay unless they are. Use this as an R&D exercise for government software procurement to see if doing things differently actually does pay dividends. If Government is serious about reform it needs to test new methods in real situations. Given the track record of government funded software projects, a modest R&D project to explore an alternative approach seems entirely justified.
90. Provide a national training scheme for teachers in using Moodle to support learning and for the development of open learning courses to share. This will be more efficient than having to cope with many flavours of VLE - one set of training, one set of documentation and a guarantee of interoperability and cross platform operation. Commercial suppliers that believe they can provide superior training either on Moodle or other products are free to do so. Moodle is Open and will always work across platforms. If anyone complains that Moodle is missing features or inferior to some other product, they are free to add the features or to use the other products. In effect the DfES is using Moodle as a practical illustration of its learning platform definition, it is not forcing anyone to use it. This is rather similar to OpenOffice.org being the benchmark illustration of an ODF application. It does not stop other applications adopting ODF, whether Open or Closed source.
91. Operate competitions for the best contributions to the Moodle learning community from schools encouraging student participation. They will be able to achieve a VRQ<sup>19</sup> at L2 through the Learning Machine Ltd, an OSC company, for making a contribution to an Open Source community project.

For example, specialist schools could be required to submit something useful in their subject specialism as part of their qualification for redesignation. City Academies should produce a new and original Moodle course as part of their incorporation. We have the expertise in the Open Source community to manage and support such projects. Promote collaborative community projects to develop Moodle learning content and provide prizes of additional funding for the winners. In short, provide incentives for the pioneers to transform learning through participation and to promote social enterprise and others will follow. Are we really serious about transforming learning or is it just rhetoric?

**92. Potential objections**

93. Commercial suppliers have invested millions in their VLE products yet the Government is showing favouritism to one product.
94. The reason for choosing Moodle as a benchmark is that it is fully open, in widespread use globally and enjoys continued support and development. If any of the commercial suppliers is willing to release their control over their product code through an approved Open Source license, BECTA will consider it on merit against Moodle. The DfES' prime considerations are reform of the process of learning to meet 21st Century learning needs and value for money for the taxpayer. Consistent with National Audit Office guidance and the e-gif policy there is an onus on Government to avoid proprietary lock-in and promote interoperability. Moodle represents the best current option to avoid lock-in to specific vendors and to further interoperability between schools in England and Wales and internationally. These factors are highly valued and are decisive in choosing the benchmark for learning platforms. If a company has a significantly better product or more cost-effective strategy for schools and RBCs, there is nothing to prevent take up of that product but the product must be capable of interoperability with Moodle as the adopted bench mark of the standards for interoperability.

**95. How can we stimulate the production of Open Source web based applications to open standards that are platform neutral?**

96. Use existing initiatives. Specialist Schools have a mandate to provide national leadership in their subject specialism. City Academies are expected to be experimenting with new learning methods. Schools are expected to provide extended services. Curriculum On-Line is a source of funding and a repository for on-line learning resources.
97. Make an Open Source section on Curriculum On-Line where resources can be freely and directly uploaded and downloaded. (Use a wiki, SF-UK's entire web site is a wiki so we can provide the necessary support and we have proof of concept.) Organise the section by NC subject and Key Stage. Sub-divide into relevant parts of the programmes of study. Commission some examples of useful applications as documented models for others to follow. Allocate a budget of say £100K this financial year with a view to increasing it next if this years work is a success. All this work could be done through SF-UK/OSC/OFE or a BECTA/SF-UK/OSC/OFE partnership.
98. Require specialist schools to submit one application supporting at least one hour of learning in their subject for their primary partners in order to

be redesignated as a specialist school. They already have community funding for this type of thing. They can either develop the software in-house using staff and students or commission a programmer to do it for them. We can put up a list of appropriate companies and contacts who can support this work. (Students in the schools that make reasonable contributions will be able to count them towards a VRQ in ICT and Open Systems at level 2) They will hold copyright for their work but to be accepted they must issue it under an approved OSI Open Source license. ([www.opensource.org/license/index.php](http://www.opensource.org/license/index.php)). The school's name (and/or student's name where appropriate) will be attached to the work and so schools will not in general want to be associated with poor work. Since the work will be Open Source, any shortcomings can be easily improved by anyone who can do better. For each application, have a link to a ratings section where users can comment on how useful the application is and how it might be improved. Quality Assurance will be done by natural selection which is the usual Open Source way. Use the ratings section as a basis for making awards for the best contributions to motivate high quality contributions. Encourage students to Learn Through Participation.

99. To start with, make this a remit for City Academies and Specialist Schools in Mathematics and Computing and Science that are due for redesignation in 2007 and any school applying for mathematics or science as a second specialism. Limit to software to support primary schools in the first instance to keep things manageable and call it a pilot. This can be announced as soon as possible and incorporated in the revision to the guidance for Specialist Schools this summer. We can provide appropriate training for SSAT consultants supporting the schools. Encourage student input as part of an Extended Services programme e.g. working collaboratively with a programmer in residence.
100. We are only asking for applications that support 1 hour of work from each school in the pilot so it's not a big burden (schools can contribute more if they want to). Even if they initially commission the work it should cost less than £1000 - a very small amount compared to their community funding and the money they get for redesignation. They could be allowed to use eLCs for this purpose. We can provide a template, detailed instructions and models to follow. Give prizes for the best contributions, e.g. £50k as a grant for further software development for the school making the most effective contribution to Open Source on-line learning resources. That provides positive feedback of high quality resources into the software pool. Celebrate through a BECTA Open Source Awards ceremony at BETT. It's low cost and politically low risk but, if successful, is easily scalable and provides Government with an initiative that is likely to be popular and productive. We can encourage student participation by having separate categories for student work as schools become more familiar with the way Open Source works.

### **101. Potential objections**

102. Schools are too busy to develop software
103. In the UK tradition, some of the best ideas for software to support learning have come from schools which is where the learning expertise is focused. We are adding a community dimension to Curriculum On-line to enable greater participation by schools, reinforcing the national leadership

role of City Academies and Specialist Schools in their subject specialism and promoting practical citizenship and social enterprise. The requirements are not onerous and more than adequately covered by the community funding that is already available. The schools are free to commission technical support if they so wish and simply act as quality controllers for the resources developed in their name. The individual school then benefits from all the resources developed by the other schools. If they are prepared to give a brick, in return, they get a house.

104. This will undermine the commercial software sector
105. The Government has put £330 million into the commercial software sector through Curriculum On-line and will presumably continue to fund the purchase of proprietary licensed software. If this modest initiative undermines the sector that is based on selling commercial software licenses it simply demonstrates that the commercial software sector is not producing resources efficiently in the first place. The purpose of Government is not primarily to keep software salesmen in a job. This Open Source initiative is to complement existing provision and encourage community and grass roots involvement reducing dependency culture and fostering technological enterprise. It reflects contemporary global technological practice and supports working to a position where students can be involved and learn through participation. Schools can buy commercial support if they choose and any commercial supplier with appropriate qualifications can be included on the list of potential supporters. Such an initiative is far more likely to stimulate software production that is UK based and provide support for learning in the field of technology that is sadly lacking at present.

**106. What strategies might increase the take up of Open Source Operating systems?**

107. The main reason there has not already been mass migration to GNU/Linux/BSD Unix is that most applications are dependent on Windows. A secondary reason is that technical support in schools is lacking in knowledge about Unix compared to Windows. Stimulating the production of platform neutral applications and discouraging the development of entirely Windows-centric applications is the most important strategy to increase take up of Open Source operating systems.
108. Some specific zero cost actions would be:
109. Announce that it is Government policy to promote the production of platform neutral learning applications.
110. Insist all new COL titles must be capable of running across at least Windows, Mac OSX<sup>27</sup> and Debian GNU/Linux (Debian as it is not specifically linked to any commercial company and therefore there is no particular favouritism. In practice , if it works on Debian it is very likely to work on other variants too. Note that from a Government neutrality point of view Debian is a better choice than say Red Hat, Suse or Mandriva which are all closely associated with commercial companies)
111. Earmark any under-spend of Curriculum On-Line funding this year to enable companies to bid for funding to convert applications to work to web

based standards. Give priority to the most popular COL titles that are going to be least expensive to convert.

112. Stop taking advice from large companies with a vested interest in proprietary licensed software about technological strategy where there is a clear conflict of interest.
113. Extend the Specialist Schools project to develop the COL Open Source section to all specialisms and to KS3 and KS4 with reference to extended services. From April 2007, earmark 20% of current COL funding ie £20 million a year to support this development through additional grant funding for the schools that are most effective in commissioning/producing Open Source resources and are most effective in involving their pupils in production. Develop international links to involve co-operative development by UK students and students in developing countries in their own projects to produce Open Source learning resources for the benefit of all.
114. Link the web based Open Source resources to development of Moodle courses and systematic support of the entire NC with availability from any IT platform with any standards compliant browser software. Encourage commercial companies to support commercial courses through innovative organisation of the Open Source resources including training and support.

### ***Summary of key strategies***

115. Agree in principle that practical positive leadership is required if Open Source is to best support Government policy and the e-strategy. This requires change in the way things are done. No change, no reform.
116. Elicit a clear announcement from Ministers of the strategy to involve schools in social enterprise activities to develop their own Open Source on-line learning resources as part of the learning reform strategy. Promote the transformation of learning through the new Learning Through Participation paradigm. Link to City Academies, Specialist Schools, and Extended Services to provide strategic focus.
117. Support further collaboration between BECTA/DfES and SF-UK/OSC/OFE in a public private partnership to put specific detail to projects with a costed management plan, output targets and timescales.
118. Specific projects that could be supported inexpensively:
  - A compact reader for ISO 26300 documents
  - Adoption of Moodle as a benchmark VLE
  - Production of open source web based learning applications by schools in collaboration with the Open Source community.
  - Insist that new applications submitted to COL conform to web based standards and can run reliably on Windows, Mac OSX and Debian GNU/Linux
  - Insist that to qualify for eLC funding, desktop applications must conform to the same accessibility standards as required of web applications

## References

**If a web link does not work immediately by clicking on it try copying and pasting into the URL input of your browser. On paper and pdf versions of this document the end of the reference titles will have strange characters. For the Open Document format file, these provide links back to the reference for those that prefer to read from a computer screen.**

1 Growth in Open Source Software. Click the T at the end of the line to jump back  
T  
<http://www.iist.unu.edu/globaldesktop/>

2 Techno-social tipping points. Click "that" at the end of the line to jump back that  
[http://www.cio-today.com/story.xhtml?story\\_id=30926](http://www.cio-today.com/story.xhtml?story_id=30926)

3 Open Documents (ISO 26300) It  
<http://www.odfalliance.org/about.php>

4 Digital Divide Coar  
[http://en.wikipedia.org/wiki/Digital\\_divide](http://en.wikipedia.org/wiki/Digital_divide)  
<http://www.ecommercetimes.com/story/50329.html>

Getting access to the information is fundamental to bridging the digital divide. While it's not the only factor, getting the price point of "good enough" technology down to a level affordable by the disenfranchised is still significant and more significant the poorer you are.

5 BECTA research on Total Cost of Ownership: Click to jump back sT  
TCO study outside education

[http://www.becta.org.uk/corporate/publications/documents/BEC5606\\_Full\\_report18.pdf](http://www.becta.org.uk/corporate/publications/documents/BEC5606_Full_report18.pdf)  
<http://news.zdnet.co.uk/software/linuxunix/0,39020390,39180701,00.htm>

Note that TCO is a complex issue and is often used as a marketing tool. It first came to prominence when PCs became much less expensive to buy than Apple computers due to economies of scale and Apple claimed that the savings due to ease of use of their machines outweighed the initial higher purchase costs. It is worth considering that any new relatively small scale technology is likely to get less expensive as people learn more and initial transitory costs are absorbed in mass take up. The return on investment in making change is in the long run more important than the immediate short term TCO. In the steady state, a system with no license fees is always going to be less expensive than one with if all other things are equal. The issue is in how long any immediate costs of making a change take to be recouped by lower long term costs. The migration experience of Bristol LA suggests the real cost of change have often been over-estimated. "So far, the experience of migrating users has proved that the cost of migration is low and ease of use is high. We now have concrete evidence that less effort is required to deploy the software, support and train users than we estimated," said Gavin Beckett.

6 Government Policy: Click to jump back i

Higher Standards, Better Schools for all, more choice for parents and pupils  
14-19 Education and Skills

[http://www.dfes.gov.uk/publications/schoolswhitepaper/pdfs/DfES-Schools\\_White\\_Paper.pdf](http://www.dfes.gov.uk/publications/schoolswhitepaper/pdfs/DfES-Schools_White_Paper.pdf)  
<http://www.dfes.gov.uk/publications/14-19educationandskills/pdfs/14-19WhitePaper.pdf>

Internationalism

[http://www.dfes.gov.uk/pns/DisplayPN.cgi?pn\\_id=2004\\_0021](http://www.dfes.gov.uk/pns/DisplayPN.cgi?pn_id=2004_0021)

Citizenship

<http://www.dfes.gov.uk/citizenship/section.cfm?sectionId=5&hierachy=1.5>

Social Enterprise

<http://www.standards.dfes.gov.uk/forums/showflat.php?Cat=&Number=1966&page=0>

Vocational learning

<http://www.ssatrust.org.uk/vocationallearning/default.aspa>

Personalised learning

<http://www.standards.dfes.gov.uk/personalisedlearning/>

Understanding technology

<http://www.dti.gov.uk/innovation/index.html>

The environment and innovation

<http://www.parliament.uk/documents/upload/POSTpn212.pdf>

7 e-gif Policy poas

[http://archive.cabinetoffice.gov.uk/e-envoy/briefings-top/\\$file/interoperability.htm](http://archive.cabinetoffice.gov.uk/e-envoy/briefings-top/$file/interoperability.htm)

8 W3C - The World Wide Web Consortium anst

<http://www.w3.org/>

9 Specialist Schools and Academies Trust a

<http://www.specialistschools.org.uk/>

10 Parliamentary standing committee comments on GCSE science and why exams need improving to reflect greater understanding and less rote learning. and

<http://www.publications.parliament.uk/pa/cm200102/cmselect/cmsctech/508/50808.htm>

11 Environmental costs of computer manufacture Eff

[http://www.guardian.co.uk/uk\\_news/story/0,3604,1164372,00.html](http://www.guardian.co.uk/uk_news/story/0,3604,1164372,00.html)

12 Monopolies and closed standards O

Open Source communities have no competitors, they exist to further the needs of the community and anyone can be a member of the community. However, individual Open Source products do have competition from and provide competition to other software products. The competition is most significant with products based on closed standards that have global take up. It is therefore inevitable that Microsoft and its business strategies come into almost every discussion of OSS even though the company itself is not the issue, it's the effect of the monopoly on the industry at large. Simply, companies with business models based on selling proprietary licenses are going to be hit hardest as Open Source take up makes operating systems, infrastructure and productivity tools free from the need for paid licenses. Every key player in the market understands it, even Microsoft. Microsoft has to try to delay the outcome, though, in order to find alternative business models to replace its traditional business and it is not going to find another monopoly like Windows easily.

Abuse of a dominant position in the market

<http://cyber.law.harvard.edu/msdoj/>

<http://cyber.law.harvard.edu/msdoj/>

It seems likely that Microsoft will continue to break the law as long as in doing so it makes more money than the fines levied. It is to them a legitimate business expense and delaying judgments through appeals and prevarication maintains a large income. The disincentive for a government to take legal action is huge since the company reserves billions as a legal war chest to fight such action and cases are complex and technical. It is therefore likely that a great deal more of MSFT's activities are illegal but taking action is effectively deterred. Microsoft Schools Agreement, is a good example. A strategy to promote Open Source as a viable competitor is probably a lot less expensive and more effective than taking legal action.

Microsoft Schools Agreement lic

[http://www.pugh.co.uk/Products/microsoft/school\\_agreement.htm](http://www.pugh.co.uk/Products/microsoft/school_agreement.htm)

Microsoft Schools Agreement could be illegal. It effectively makes schools pay licenses for computers that do not run any MSFT software so it is clearly anti-competitive. If a GNU/Linux vendor tries to sell a PC running GNU/Linux to a school operating Schools Agreement, the school has to pay MSFT an annual license fee. That is the equivalent of BT requiring payment if NTL put a cable to your house. The OFT investigated but failed to come to a definitive conclusion. The correspondence with the OFT seems to indicate that this is more to do with the cost of taking on MSFT in a legal battle than anything else. The only way to definitely determine if Schools Agreement is illegal is to test it in court and since MSFT submitted 30,000 pages of evidence to the investigation this is likely to be expensive. The worst strategy would be if the DfES bought into a MS School agreement type arrangement for all schools. On the face of it, it might look a financially attractive option with lower prices through an economy of scale in the short term but it would make the chances of change almost impossible by fully locking all schools into a single vendor monopoly

and killing any incentive to produce any desktop applications that ran on anything but Windows.

### 12.1 Microsoft and technology hegemony So

<http://www.joelonsoftware.com/articles/APIWar.html>

While the whole of this article is interesting and relevant to understanding why the MSFT business model is showing signs of faltering (eg recent fall in share price), the most relevant part to the referenced text is towards the end in the section "It's not 1990".

### 12.2 Microsoft product lines and profitabilitys

[http://www.microsoft.com/msft/earnings/FY05/earn\\_rel\\_q4\\_05.msp](http://www.microsoft.com/msft/earnings/FY05/earn_rel_q4_05.msp)

Microsoft client segment is all about Windows client operating systems. In 2005 it achieved a revenue of \$12.2 billion dollars with a profit of \$9.4 billion - approximately 77% margin. The information worker segment which is Microsoft Office achieved a revenue of \$11 billion and operating profit of \$7.9 billion. approximately 72% margin. Server products \$9.8 billion and a \$3.3 billion profit or 34%

Together these products account for profits of \$20.6 billion. The overall profit from all business was \$14.5 billion showing that the operating system and office products are subsidising the rest of the business to the tune of \$6 billion dollars a year. The money spend on software development is relatively small and would probably be smaller still if the business had to be efficient in a fiercely competitive market. Fundamentally, MSFT is not profitable except in markets where it has a monopoly derived from the desktop operating system.

### 13 Thin Clients w

Thin clients are computer terminals that run applications on servers. They can be physically small and run low power consumption processors that do not need cooling fans and therefore reduce noise and heat. They do not need disc drives and can operate with minimal memory and are therefore low power consumption. Neither do they use a lot of network bandwidth. However, thin clients do need more powerful servers and so there is some trade off in cost and power consumption. Nevertheless, in principle thin clients should lower infrastructural costs and reduce total cost of ownership because upgrading half a dozen servers automatically upgrades perhaps two hundred clients. Managing the servers effectively manages all the clients. The main commercial supplier of thin client software is Citrix and the premium paid for Citrix licenses negates a good part of any initial cost savings forming a barrier to adoption. In addition to this, the volume of software applications that are dependent on locally installed Windows is also a barrier to change. Open Source thin clients are free of license costs but again the dependency of applications on Windows makes the wholesale adoption of this technology slow and consequently the lack of economies of scale mean the hardware is relatively more expensive than it would be if sold in large volume. One school of thought is that mobile telephones will evolve into thin client terminals and certainly there is no real technical reason for this not to happen now. All that is needed is for new screen technology that can be folded to fit in a pocket to become widespread. Again, it's the inertia of old legacy technologies that holds back more efficient ways of working. Current Open Source thin client technology is particularly well-suited to generic productivity tools and web based applications that conform to open standards which is another reason for stimulating the production of open web based learning applications.

### 14 Use of the Internet by different social groups an

<http://www.citizenonline.org.uk/statistics>

### 15 Curriculum On-line seems

<http://www.curriculumonline.org.uk/>

### 16 The Economics of Open Source Development Ufrom

<http://perens.com/Articles/Economic.html>

### 17 Competition commission and Office of Fair Trading There

<http://www.competition-commission.org.uk/>

<http://www.oft.gov.uk/default.htm>

### 18 Software as a commodity on

[http://www.netc.org/openoptions/pros\\_cons/markets.html](http://www.netc.org/openoptions/pros_cons/markets.html)

Scroll down a bit to read the part on software as a commodity

19 Open Source VRQ whereat

<http://www.theINGOTs.org/>

20 Moodle thrives

<http://moodle.org/>

21 OpenOffice.org Statistics bec

<http://stats.openoffice.org/#stats>

22 Leadership starts

I first looked for a leadership reference on the site of the National College for School Leadership <http://www.ncsl.org.uk/> but didn't find any generally useful explanations of what leadership actually is or requires. The summary below would probably be a good thing to link from their home page [http://www.meansbusiness.com/summary\\_p.asp?FID=E994C0B0D7E543C6AF7F9B62A2884E82](http://www.meansbusiness.com/summary_p.asp?FID=E994C0B0D7E543C6AF7F9B62A2884E82)

Additional material from <http://en.wikipedia.org/wiki/Leadership>

Wikipedia is yet another world class free resource enabled by the principles of the Open Source Community.

23 The IBM PC An o

<http://inventors.about.com/library/weekly/aa033099.htm>

Interestingly MS DOS was a re-write of c/p/m just enough changed to avoid falling foul of copyright, bought by Bill Gates for \$50k and licensed to IBM. Gates idea for Basic built into ROM was already established by Acorn in the UK. There was not much that was innovative about the IBM PC except that it was backed by IBM and that it was built from standard components, open architecture. Open Source software is really the software equivalent of the IBM open architecture hardware without the problems of key components being owned by Intel and Microsoft. Just as the IBM PC hardware has evolved to more sophistication, we see the same thing with Open Source applications over time.

24 Sustainability mom

<http://www.openconference.net/viewabstract.php?cf=3&id=57>

[http://www.oii.ox.ac.uk/research/files/OSSWatch\\_2006\\_Sustainability&FLOSS\\_txt4+slides0506.pdf](http://www.oii.ox.ac.uk/research/files/OSSWatch_2006_Sustainability&FLOSS_txt4+slides0506.pdf)

[http://www.jisc.ac.uk/index.cfm?name=pub\\_ossbp](http://www.jisc.ac.uk/index.cfm?name=pub_ossbp)

First reference is a European perspective on Open Source and its sustainability in education. The second is a detailed research paper, the third is a shorter summary of Open Source issues with some reference to sustainability.

25 World Governments It's

<http://news.zdnet.co.uk/software/linuxunix/0,39020390,39150645,00.htm>

[http://www.linuxdevcenter.com/pub/a/linux/2002/07/15/osgov\\_timeline.html](http://www.linuxdevcenter.com/pub/a/linux/2002/07/15/osgov_timeline.html)

26 Open Document Fellowship A p

Open Document Fellowship is a voluntary not for profit community organisation dedicated to promoting the Open Document standard ISO 26300. Open Document Fellowship is a member of the Open Document Alliance. Whereas ODF alliance is made up of companies and organisations, OD Fellowship pre-dates the alliance and is made up of individuals. Most OD Fellowship members are also advocates of Open Standards in general and Open Source but OD Fellowship is fundamentally an Open Standards rather than an Open Source pressure group.

<http://www.opendocumentfellowship.org/>

27 Mac OSX and D

<http://www.apple.com/macosx/>

It's worth noting that Mac OS X is itself derived from BSD Unix, an Open Source operating system. Mac OS X and GNU/Linux are both Unix operating systems at heart.

28 Debian GNU

<http://www.debian.org/>

### **General references**

Explanations of a range of Open Source licenses

<http://www.iist.unu.edu/globaldesktop/>

Relationship between BECTA and the DfES

[http://foi.becta.org.uk/content\\_files/corporate/resources/policy\\_and\\_strategy/links/mou\\_dfes.pdf](http://foi.becta.org.uk/content_files/corporate/resources/policy_and_strategy/links/mou_dfes.pdf)

Open Source in a Company Business Model

[http://www.infracore.com/presentations/present\\_OSSWATCH\\_osmodel](http://www.infracore.com/presentations/present_OSSWATCH_osmodel)

## Glossary

Apache webserver	The leading global software application for serving Internet web pages.
Apple OS X	Apple Computer's proprietary operating system based on the Open Source Berkley Standard Distribution of Unix.
BECTA	British Education and Communications Technology Agency. Advisor to Government on issues related to ICT in schools.
BETT	British Education Training and Technology Show
Citizenship	Understanding the responsibilities that accompany rights in a healthy society.
City Academy	New school partly sponsored by private sector and with governance independent of the Local Authority.
Curriculum on-line	Website that catalogues resources eligible for license purchases using e-Learning Credits
De facto standard	A standard that is based on popular usage and is often controlled by a single point of interest.
DfES	Department for Education and Skills. Central government department responsible for education.
Digital divide	Difference in access to ICT facilities based on economic, social or educational factors.
e-gif	e-Government Interoperability Framework. The framework that enables interoperation between a range of technologies.
e-Learning Credits (eLCs)	Government funding for schools in England restricted to spending on licenses for software and digital content that supports learning
e-strategy	Government Policy intended to promote learning through the use of ICT.
Extended services	Government initiative to extend the school day by providing learning opportunities before formal school starts and after it ends.
FLOSSIE conference	Free Libre Open Source Software in Education. Annual conference devoted to Open Source and its use in schools organised by SF-UK.
Forced upgrade	Where a computer has to be upgraded for reasons of compatibility or a decision to discontinue support for a software application. See Linux below.
GNU/Linux	
Hard to reach groups	People on the fringes of society who do not willingly participate in positive social activities and are often actively hostile to authority and attempts to increase their involvement.
ICT	Information and communications technology
Internationalism	Developing awareness, tolerance and co-operation with people in other countries.
INGOT	International Grades in Office Technology. A vocationally related qualification in open standards and office applications with a community dimension for learning through

	participation.
ISO 26300	Open Document format's registered number with the international standards organisation, ISO.
Koffice	Open Source office software that uses OpenDocument format and runs on GNU/Linux. A MS Windows version is being developed.
Key Stage 3 Tests	National tests for 14 year olds. These are provided in English, maths and science with an on-line ICT test in pilot at the time of writing.
Learning through participation	Learning by taking part in productive projects to produce useful services and resources rather than as a theoretical exercise.
Linux	More accurately GNU/Linux. Open Source operating system with a unix-like kernel (Linux) and supporting applications from the Free Software Foundation (GNU).
Local authority	Local political grouping with delegated responsibility for education in its geographical area.
Microsoft Schools Agreement	Microsoft annual license for several core pieces of software with payment based on the number of computers in the school.
Monopoly	Single source of supply. In competition law it means with sufficient market share to use the size of the customer base to impede competition. This can be as little as 25% market share.
Moodle	Open Source virtual learning environment.
Mozilla Firefox	Open Source web browser.
MS Windows	See Windows below.
National Curriculum	The statutory framework for teaching and learning in schools.
National Digital Infrastructure	The hardware, software, standards and protocols needed for running educational software applications and exchanging digital information.
Open Document Alliance	International group of organisations and companies supporting Open Documents.
Open Document Fellowship	International group of individuals and volunteers supporting Open Documents.
Open Document Format	An XML based file format that is not controlled by any individual company or interest and is designated ISO 26300.
Open Forum Europe	A not for profit, independent organisation formed to strengthen the use of Open Source Software in business and government.
OpenOffice.org	Open Source office software that uses odf as its default file format.
Open source community	Developers and users of Open Source Software.
Open Source Consortium	A not for profit trade organisation that guarantees the quality of Open Source deployments in the public sector.
Open Source Software	Software where the source code is licensed to be freely copied and modified.
Open standards	Standards that can be used freely by anyone without payment and which are not controlled by a single for profit company.

OSI	Open Source Initiative, organisation responsible for managing the definition of Open Source.
Personalised learning	Learning that is based on the specific needs and interests of the individual.
RBC	Regional Broadband Consortium. Provide filtered internet access to schools.
Redesignation	Process by which specialist schools renew their status and funding as a specialist school.
Schoolforge UK	A voluntary organisation devoted to promoting open resources for education.
Social enterprise	Enterprising activities that provide resources and benefits for the good of society.
Social inclusion	Including all citizens in important social activities irrespective of their economic or cultural backgrounds.
Software license	The rights granted to users of software by the copyright holder. Commercial proprietary software licenses require payment, usually to the copyright holder. Open Source licenses do not require payment but are often, but not always, conditional on making any improvements made to the original code, freely available to the community.
Specialist School	A school that gets additional government grant to promote raising attainment and community development through focus on one or more subjects in the curriculum.
SSAT	Specialist Schools and Academies Trust. Government funded Agency that supports the Specialist Schools and Academies program.
Thin client	A computer terminal that simply handles screen drawing and input from the keyboard and leaves the running of applications to a sever.
Third sector	Companies, organisations and volunteers who work for the community and social good rather than for personal profit or gain. As distinct from public and private sectors.
VLE	Virtual Learning environment, a suite of software that supports learning, assessment and target setting.
Vocational learning	Learning that prepares people with the specific skills and knowledge needed for employment and voluntary service.
VRQ	Vocationally related qualification.
W3C	The World Wide Web Consortium is an international consortium dedicated to leading the World Wide Web to its full potential by developing protocols and guidelines that ensure long term growth.
WCAG	Web Content Accessibility Guidelines
Wiki	Editable website used for collaborative projects
Windows	Proprietary operating system licensed by Microsoft.
Writely	Web based word processor that uses Open Document Format.