

THE DARK SIDE OF GLOW: BALANCING THE DISCOURSE

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ABSTRACT

Glow is a £40m public-private partnership project that aims to connect 800,000 Scottish pupils, parents and teachers, equipping them with online tools and resources for email, electronic conferencing and file sharing, that will support the new Curriculum for Excellence. The discourse that has developed around Glow focuses almost exclusively on the technology's intended outcomes, all of which are said to be benefits. However, as with all technology, there will also be some unintended outcomes, some of which may be unwelcome. This paper explores what might be termed 'the dark side of Glow': the opportunity costs of the project and its risks and threats, including those of project failure, managerialism, inequity, cultural trivialisation and surface change. It is argued that an acknowledgement of the dark side is essential in order that risks and threats can be addressed and mitigated. At present, the lack of balance in the discourse not only reflects badly on the quality of critical thinking in Scottish education but also increases the likelihood of unwelcome outcomes.

INTRODUCTION

By the end of 2008 every school in Scotland is expected to have access to Glow, the new digital network funded by the Scottish Government and managed by Learning and Teaching Scotland (LTS) in partnership with computer company RM. Glow will provide fast broadband communication, a national directory and authentication system, collaborative software tools and a virtual learning environment. All of this will be delivered through the web, using standard web browser software. According to LTS, the outcomes of the new technology will be wholly beneficial:

Across the world, technology is transforming the way people experience education. Glow will place Scottish education at the front of the revolution. It will enable education authorities, schools and teachers to educate Scottish children and young people to high technological standards. It will also link the national educational community in a powerful communications network — for everyone's benefit. (LTS 2008a)

Alas, the real world is not so straightforward. In reality, the nature of the 'transforming' effect of technology on education is complex and controversial. The notion of educating young people 'to high technological standards' is deeply problematic. As for the idea that technological change can be both revolutionary and 'for everyone's benefit', that seems flatly to contradict history, not only with regard to public-private partnership (PPP) projects and government-backed IT projects but the history of technology generally (Edgerton 2006).

Occasional paragraphs of purple prose might be forgiven as the work of over-excited project managers. But in fact, the example quoted above is quite typical of the discourse that has developed around Glow. Whereas traces of a counter-discourse that is more measured and critical are hard to find, examples abound within the pages of the LTS house magazine 'Connected', on the LTS website, and in the blogosphere, of an optimistic euphoria around Glow. The language that is used is quite reminiscent of what Robert Shiller called the 'irrational exuberance' that characterised the 1990s dot-com industry before its spectacular crash (Shiller 2000). For instance, it is interesting to compare the quotation that is cited above from LTS with the headline that was provocatively splashed in July 1997 on the front cover of *Wired*, the cult technology magazine:

We're facing 25 years of prosperity, freedom, and a better environment for the whole world. You got a problem with that? (Wired 1997)

The purpose of this paper is to begin to redress the balance in the discourse. It opens by reviewing the benefits that Glow is claimed to deliver to teachers, employers, learners and parents. However, these benefits must be related at least to their opportunity costs: the costs of Glow in terms of what might have been achieved had its budgets and resources been allocated differently. Next, the paper observes that, whereas the intended outcomes are invariably benefits, as with all projects there is a likelihood of some outcomes that are unintended. Included here are risks and threats relating to project delivery, reliability, security and privacy, all of which are well documented in relation to IT projects and which in extreme manifestations can amount to an overall judgment of failure.

More particular to Glow are some threats that are discussed next: that its adoption could strengthen managerialism, increase inequity, trivialise culture, or stimulate merely surface forms of change. These issues could each justify an entire paper of discussion. Taken together they represent what might be called ‘the dark side of Glow’. In the paper’s final section, the question is addressed as to why the dark side has been so little explored. The one-sidedness of the discourse must be challenged if Scotland is to achieve some semblance of critical thinking around Glow. The opportunity costs of the project cannot now be recovered, but risks can sometimes be managed and mitigated; providing they have first been identified and understood (Higuera & Haimes, 1996).

THE BENEFITS OF GLOW

Table 1 summarises the claimed benefits of Glow. This information is taken from the LTS website (LTS 2008b). The list is manifestly formidable, perhaps even implausible, in its boldness and ambition. Clearly, an item-by-item discussion is not feasible within the space available to this paper. However, it seems fair to ask whether, at this early stage in the development of Glow, the use of the word ‘benefits’ (as opposed to say, ‘promises’ or even ‘opportunities’) might be presumptuous. The fact is that well-researched empirically based studies of (actually achieved) benefits will require extensive observation of the system in use. Such studies are unlikely to be available and published before the main service contract with RM expires in September 2010 (LTS 2008c). By that time, the technology (and perhaps the policy) will no doubt have moved on.

For teachers	<ul style="list-style-type: none"> • Access to high quality teaching resources built specifically for the Scottish curriculum • Deliver and mark pupils’ assignments online • Save time with online assessment and tracking tools • Personalised easy-to-search workspace • Effortless working and sharing resources with colleagues
For local authorities	<ul style="list-style-type: none"> • Faster and more reliable access to content • Opportunities for technical innovation • Greater efficiency of support • Cost-efficiency through economies of scale • Adding benefit to existing investment • Providing a focus for future investment
For learners	<ul style="list-style-type: none"> • Access online learning resources, whatever their location, background or circumstances • World class personalised learning opportunities using a range of tools together in the one environment to work on in school or at home • Collaborate with others in their school, in their local area, in other parts of Scotland or much further afield
For school administration	<ul style="list-style-type: none"> • Simplify and speed up almost every task related to running a school • Share important information quickly and easily • Help set the same standards across schools and local authorities • New possibilities for networking, collaborating, setting up working groups and sharing information about CPD • High quality courses available on the system
For school managers	<ul style="list-style-type: none"> • In-depth support for national initiatives • Resources covering all five National Priorities, as well as the four capacities of Curriculum for Excellence • Share information easily with other school managers
For parents	<ul style="list-style-type: none"> • Access to information that is reliable, up-to-date, targeted and secure • Online discussions with other parents • See what your child will do next at school and how they performed in any class tests • View school news, timetables, homework and news targeted to parents

Table 1: Claimed benefits of Glow

OPPORTUNITY COSTS

According to LTS's Director of Learning and Technology, the costs of Glow ought to be considered in the context of its scale:

The numbers are big with Glow not only in terms of cost but also coverage: all 32 local authorities; 3000 schools; 750,000 learners; 53,000 teachers; all trainee teachers and their lecturers; all local authority education staff; SQA; HMIE; LTS and others. Over time we also want to work with local authorities to provide access to parents, but that may be a few years down the line. When you take that into account, £40m doesn't seem as much. That's not to say that I'm not conscious that it's £40m of taxpayers' money that could have been spent on health or other key areas, but you have to have a sense of scale. (LTS 2008d)

The final sentence of this extract of interview acknowledges that like all projects, Glow has not only a fiscal cost but an opportunity cost too. A dictionary definition of opportunity cost is 'the loss of potential gain from other alternatives when one alternative is chosen' (New Oxford American Dictionary, 2008). Arguably however, the reference to 'health or other key areas' is misplaced. More appropriate alternatives to Glow would be those that aimed to achieve benefits comparable to those that are claimed for Glow, that is, benefits arising from the adoption of technology within education.

There are many clues in the research literature about how improvement in this field might be effected. Conlon and Simpson's study (2003) found that 42% of Scottish secondary pupils regarded their work with school computers as 'boring', with teachers complaining that schools' infrastructure in IT was weak, their own IT skills were insecure, and the curriculum and assessment regimes under which they worked were too constraining. Similar findings came from Cuban (2001) who identified computer usage in US schools as mostly unimaginative. In their survey of UK school technology, Reynolds *et al.* (2003: 151) reported that 'ICT in the curriculum has been broken-backed without a pedagogic spine to provide the necessary structure and support'.

Table 2 identifies three hypothetical policy options that might plausibly address these issues. Each could improve the status of schools' infrastructure, teachers' skills or pedagogy. Each is an alternative to Glow in the sense that it would require similar expenditure. Of course, this is a relatively crude device that takes no account of the differences between schools and teachers (many of whom already own their own portable computers, for example). In reality, each policy option should be explored and refined by a full-scale feasibility study from which could emerge some combination of these and other options, such as the adoption of open-source software. However, unless the government decides to produce another £40m, these opportunities seem to have been lost: they are part of the cost of Glow.

The notion of opportunity cost ought arguably to be extended well beyond the idea of 'alternative expenditure'. For instance, the time and energy that has been committed by Glow mentors to their work can be seen as a lost opportunity to promote other areas of CPD. The effort needed by school staff to install and maintain Glow's new systems is effort that might instead be devoted to ensuring the smooth operation of existing systems. The focus gained by teachers on Glow's package of software is potentially focus lost on other, perhaps more or equally valuable types of software. The contract won by RM that employs numerous software developers in Oxfordshire can be seen as the loss of a similar number of software jobs in Scotland and a loss of control of educational technology by the Scottish government. These opportunity costs are hard to quantify but, whereas budgets might be replaced, human time and commitment once spent is not thereafter recoverable.

Policy	Aim	Intended outcomes	Assumptions
Computers for teachers	Give every teacher in Scotland a portable internet-ready computer	Improve teachers' IT skills; ensure teachers have access to computers	Price per computer is £755 (£40m divided by 53,000 teachers).
IT support staff	Cover the salary costs of an additional IT support worker for every secondary school for 5 years	Improve schools' IT infrastructure and support	Salary cost annually is £20k (£40m divided by 400 schools divided by 5 years)
Chartered teachers	Pay all tuition fees for 10,000 Scottish teachers on a Chartered Teacher programme	Improve teachers' knowledge and skills; promote a more diverse pedagogy	Tuition fees £4000 per course (£40m divided by 10,000 teachers)

Table 2: Three policy options that exemplify alternatives to Glow

RISKS AND THREATS

Scotland has already committed itself to Glow and so its opportunity costs are already spent. In contrast, risks and threats describe possible outcomes that have not yet occurred. At least in theory, they can be addressed and mitigated. But this requires that they first be identified, and this is the aim of the sections that follow.

PROJECT FAILURE

Computer systems development is a process that is inherently vulnerable to cost overruns, shifting targets, poor communication and creeping complexity. When the result is a system that is seriously over-budget, behind schedule, unreliable, unsafe, insecure, or too difficult to use, then the project may be deemed an overall failure or even a disaster (Neumann 1995).

Several government-sponsored PPP IT projects have been accused recently of failure or disaster. Examples are the much-delayed £12.7bn overhaul of IT in the NHS (Guardian 2008b), the HM Revenue and Customs child benefits system which lost in the post two unencrypted CDs containing personal details of 25 million people (Guardian 2007), and the Department of Health's £8m online selection system for trainee doctors which was beset with technical problems (BBC 2007). Whittaker (1999) reported that 31 per cent of software projects were cancelled before completion and more than half cost an average of 189 per cent of the original estimates. The three most common reasons for project failure were identified as poor project planning, a weak business case and a lack of top management involvement and support.

But perhaps Glow will succeed in meeting its delivery timescales and budget targets. Perhaps also it will satisfy its requirements for usability and usefulness. Yet the project will still be deemed a failure if its security is seriously weak. And with 800,000 passwords in circulation, this is obviously a real risk. Consider the range of events that could potentially compromise security: 'borrowing' somebody's password; leaving a computer unattended after logging in; downloading data from Glow to an unsecured memory stick, CD, or hard drive; or unwittingly uploading to Glow a file, such as an email attachment, that has been infected by a virus.

More worrying still is the prospect of deliberate attacks. With its abundant data, youthful user profile and web-based access, Glow will be a magnet for all kinds of hackers, spammers, data thieves and malware distributors. Since hackers have been able to exploit vulnerabilities in the websites of banks, military organisations, and technology companies, Glow might not represent too difficult a target. Indeed, there are already many reports on the internet of school computer networks that have been 'hacked' to change grades, steal test papers, and install unauthorised software. As for malware, a recent survey found that every day 9,500 web pages were newly infected by viruses, trojan horses, spyware and other kinds of malevolent code (Sophos 2007).

MANAGERIALISM

In their study of management objectives in introducing new technology at work, McLoughlin and Clark (1995) made distinctions between three levels of management:

Senior managers tend to be concerned with using new technology to improve the position of the organisation in the 'external' environment, middle managers with improving the 'internal' operation of the organisation, and lower-level line managers with the use of new technology to reduce informed human intervention and thereby increase managerial control over the work process. (McLoughlin & Clark 1995: 152)

The LTS checklist of Glow's benefits (see Table 1) could almost have been written purposely to appeal to each of these three levels. Headteachers can have webpages with nice graphs of test results as marketing tools to showcase their schools to parents and politicians. Senior management staff can take advantage of the promised 'in-depth support for national initiatives' to help ensure that 'the same standards across schools and local authorities' are applied. They and their line managers can control the virtual learning environment so that the computer desktop is identical for every teacher, with a predictable and trackable use of online tests, lesson plans and classroom resources. The school's daily activities will automatically and reliably produce an electronic trail of email and forum postings, uploads, downloads and other data communications, that can be monitored from any manager's desk, or indeed from anywhere on the internet. Thus Glow would fulfil the purpose that Roszak (1986) predicted for computers generally: as 'surveillance machines'.

If this is a vision of heaven for managerialists, who are promised that Glow will 'simplify and speed up almost every task related to running a school', it may look more like hell to classroom teachers. Their professional status could be undermined as their role becomes more that of 'pedagogic technicians' (Ball 2005). Pressures on them and their pupils may increase as their performance in the speeded-up school is tracked electronically. Those teachers who strive to deliver on Glow's promise to let parents 'see what your child will do next at school and how they performed in any class tests' could find themselves harassed by 'helicopter parents' who have 24/7 access to the school's Glow data. Where they already exist, electronic home-school links seem to be a double-edged sword (BBC 2008; Guardian 2008c).

A decade ago, David Hartley predicted that school managers, influenced consciously or otherwise by theories such as Total Quality Management which derive from US business models, would eventually join up the dots between technology, curriculum and school performance:

Information technology is waiting in the wings, ready to translate and to transmit standardised curricula in time-compressed, easily consumable, totally portable packages called modules.... performativity lies in the direction of redesigned curricular content which can be electronically accessed and monitored. Once the curricular fix is taken, then the technical fix is practically possible. Education may be disembodied and replaced by charismatic software. (Hartley 1999: 137)

Nowadays, Hartley's 'portable packages' have become fashionable in e-learning circles under the new label of 'learning objects'. International standards for them exist (e.g. SCORM, sponsored by the US Department of Defense: <http://www.adlnet.gov/scorm/>) and they have gained impetus in Europe particularly in the wake of the Bologna Declaration on standardisation of higher education (Bologna 1999). But if Glow gets a repository of such packages and becomes the 'technical fix' for schools, what is the corresponding 'curricular fix'? Is it Curriculum for Excellence? Eventually, perhaps. But in the shorter term the National Qualifications, with their tightly defined content, criteria, and entry and exit points, seem a more likely target.

INEQUITY

Discussion of inequity in relation to new technology has usually focussed on the digital divide: the differences between those who have access to computers and the internet, and those who do not. These differences of access describe what Dewan and Riggins (2005) called the 'first level' of effects of digital divide, in distinction to a second level of effects that are about differences in the ability to use technology among those who have access to it. In societies in which the technology is nearly universally available, the first level of divide disappears. But the more persistent second level can be very significant, as Hargittai (2002) discovered in her study of people's online skills:

Merely offering people a network-connected machine will not ensure that they can use the medium to meet their needs because they may not be able to maximally take advantage of all that the Web has to offer. Policy decisions that aim to reduce inequalities in access to and use of information technologies must take into consideration the necessary investment in training and support as well. Like education in general, it is not enough to give people a book, we also have to teach them how to read in order to make it useful. Similarly, it is not enough to wire all communities and declare that everyone now has equal access to the Internet. People may have technical access, but they may still continue to lack effective access in that they may not know how to extract information for their needs from the Web. (Hargittai 2002)

Insofar as it will bring the same technology to all schools, Glow may help to narrow the digital divide between them. But this is true only of the first level of effects, which is anyhow becoming less important as the technology pervades schools. There will continue to be a divide at the crucial second level of effects. Some schools will be better resourced than others and better placed to offer use of the technology that is frequent, diverse and challenging. Furthermore, the second level of the digital divide is related to underlying skills, notably including literacy (Henry 2005), which are persistent and unequal between school populations.

In households if not in schools, however, not even the first level of digital divide seems likely to disappear. After many years of growth, UK internet access has levelled at around 60% of households. Household access shows some marked variance, including by region (Scotland has a far lower proportion of wired-up homes than the English south-east, for example), by age (82 per cent of the 65+ age group have never used the internet), and especially by income (51% of adults with an income of £10,400 or less are non-users) (National Statistics 2006).

If Glow becomes the main channel for communication between school and home then this is an opportunity that wealthy, wired-up families can be expected to exploit to the full. Meanwhile, those without broadband access will be literally disconnected. If children in those homes require access to Glow to do their homework, the homework will be left undone. Interestingly, of households that do not have Internet access, a quarter say that they lack the necessary skills; another indication that there is a crucial second level of digital divide. Home use of Glow will increase social inequity and this is not a problem that will vanish even if every household is given a free internet connection.

TRIVIALISATION

In his celebrated book 'Amusing Ourselves to Death', Neil Postman (1985) wrote:

When a population becomes distracted by trivia, when a cultural life is redefined as a perpetual round of entertainment, when serious public conversation becomes a form of baby-talk, when, in short, a people become an audience and their public business a vaudeville act, then a nation finds itself at risk; culture-death is a possibility. (Postman 1985: preface)

Postman's concerns were mainly with television. He argued that 'television's principal contribution to educational philosophy is the idea that teaching and entertainment are inseparable' (p150) and that its overall effect was the trivialisation of culture. Today, television is obviously celebrity-obsessed and Postman's concerns for that medium are still valid. But they seem at least as relevant to new media, including computers, games consoles, and the internet. Indeed, the boundaries between these media are dissolving. With digital television, fixed schedules of broadcasting are giving way to play-on-demand services delivered via the internet on laptops and mobile phones, for example.

Digital media bring wider choice and thus, one might hope, higher cultural standards. However, according to a recent survey the most frequently downloaded TV shows in 2007 were *Heroes*, *Top Gear*, *Battlestar Galactica*, *Lost*, *Prison Break*, *Desperate Housewives*, *24*, *Family Guy*, *Dexter* and *Scrubs*, in that order (Belham 2008). The YouTube website, now owned by Google, offers six million mostly home-made videos that reach depths of triviality that would have astonished even Postman. Triviality and unpleasantness, in fact: for instance, a search on YouTube for the term 'happy slap' delivered 117 videos posted in the last week and 'street fight' revealed 312 videos. The most popular video on the website *Pure Street Fight* was called 'Girl Beat Up In Street' and had been viewed 1,349,046 times (Guardian 2008a).

The average British 11- to 15-year-old spends seven and a half hours a day in front of a screen. Their media consumption has been claimed to contribute to a 'toxic childhood' that risks mental and physical health as well as behavioural and learning difficulties (Palmer 2006). Particular concern has been expressed about violence in video games and the risks to children's safety and privacy arising from their use of 'social networking' websites such as Bebo, MySpace and FaceBook. The government's Byron Review has called for much tighter regulation of these sites along with a 'gold standard' for the use of console games and better advice for parents on how to prevent children accessing unsuitable websites (DfES 2008).

Well intended though it may be, however, such regulation and advice does not get to the root of the internet's threat to cultural standards. According to Andrew Keen, this stems from the cacophony of amateur voices (he mentions bloggers, YouTube posters and Wikipedia contributors) whose endless self-promotion has eroded the authority of genuine experts and cultural gatekeepers, such as academics, professional journalists, musicians, and film-makers (Keen 2007). If he is right then the concept of 'the wisdom of crowds', a concept upon which depends the ranking system used by (for example) the Google search engine, is an illusion.

Will Glow accelerate the trivialisation of culture? In its defence, it might be argued that Glow's adoption could civilise schools' use of the internet, not only by blocking unsuitable websites but also by providing opportunities to learn better ways of communicating online. On the other hand, it is hard to see how an intranet — literally, an 'internal internet' — can be untainted by the problems that beset the internet itself. In particular, Glow will certainly increase the quantity of communication but that does not guarantee that it will increase its quality, any more than the internet's abundance of information can guarantee a growth of personal knowledge.

SURFACE CHANGE

The most probable outcome for Glow, and arguably therefore its greatest risk, is that it will not make much substantial difference. On the surface there will be an appearance of movement; an energetic minority will create noise and excitement but at a deeper level, the life of the school will continue much as it would had Glow not existed.

There are three reasons for thinking this a likely outcome. The first is based on the observation that much of Glow's technology is not actually new: schools have had email, shared filestores, web access, and so on, for years and their impact has been generally weak (Conlon & Simpson 2003; Cuban 2001; Reynolds *et al.* 2003). What

Glow does newly is to package these things coherently around a standard web-based interface. Where, one might ask, is the benefit — or the threat — in that? Of course, an answer to this question simply may be that a package can be much more than the sum of its parts. This, after all, is what the very paradigm of a computer network demonstrates. Perhaps Glow will overtake some threshold of integration, usefulness and usability that will cause a critical mass of teachers to really engage with the technology and make some of the benefits — and the threats — real.

The second reason is that some of Glow's technology may be fundamentally at odds with how school communities behave and change. Schools are real communities, not virtual ones; they depend on relationships that are characterised by human presence and proximity. Teachers, parents and pupils can make assumptions about trust, continuation and commitment that are normally not reliable in virtual communities. Of course, tools that enable electronically mediated communication are undeniably useful in supporting collaboration across remote or scattered communities that possibly span different time zones. But in schools, where it is possible to meet, talk and do things together, they are much less necessary.

This is not to say that there is no place for online experience. In fact, it is predictable that the role of online life will become more important. But overall, teachers will surely continue to favour face-to-face interaction over the electronic modes because face-to-face is available and richer in its communicative capability. Although Glow promises that pupils will 'collaborate with others in their school, in their local area, in other parts of Scotland or much further afield', it would be deeply ironic to base this on classrooms in which pupils, seated with backs to one another and hunched over their computers, type at their keyboards in silence. In such a scenario, school might just as well be replaced by home-based education.

The ways in which schools change are of course complex. However, through Curriculum for Excellence they are presently engaging with an education agenda that gives high priority to personalisation, choice, and flexibility. It needs to be asked whether these priorities are consistent with the design of Glow and arguably, the answer is negative. Consider some of Glow's design features: the mandatory log-in; filestores held on central servers; application software selected from a small preconfigured set; multiple levels of access privilege; a user interface that looks the same for everybody, everywhere. In sum, does this not resemble the mainframe computing of thirty years ago? Consider by contrast the almost infinite flexibility that any teacher can obtain via a home computer. Glow's design amounts to a 'national desktop'; a concept that seems anachronistic. It hardly matters that the interface can be tweaked locally and that the system is powered by 'web 2.0' technology. If teachers perceive Glow to be a centralised, inflexible, one-size-fits-all approach to technology, then they will seek alternatives and restrict their use of Glow to a necessary minimum.

In his review of twentieth-century technology, David Edgerton concluded: 'Technology has not generally been a revolutionary force; it has been responsible for keeping things the same as much as changing them' (Edgerton 2006: 212). He notes that paradoxically, calling for innovation is 'a common way of avoiding change when change is not wanted' (p210). This suggests the third reason for suspecting that surface change is a likely outcome: schools are anchored by relatively stable structures and practices of curriculum, assessment, and pedagogy. Technology innovation does not address these things directly, at least not in the way that Curriculum for Excellence does. Even supposing that its design is valid and its delivery is competent, Glow will not be the source of a revolution in learning and teaching. The anchors are too strong and if they are to be uprooted, the driving force will have to come from elsewhere.

BALANCING THE DISCOURSE

It is no surprise to find that, on inspecting the claimed benefits of Glow, it is also possible to detect lost opportunities, risks and threats. As with all technology, there will be both intended and unintended outcomes. What is surprising is that this discussion has had almost no visible presence hitherto. The silence of Scottish academics, in particular, has been deafening and as noted earlier, instead of balanced discussion, the discourse around Glow has been dominated by an 'irrational exuberance' (Shiller 2000) emanating especially from Learning and Teaching Scotland and the 'education bloggers'.

Why have academics been mostly silent? Certainly they are busy people whose published output is necessarily dispersed across a myriad of educational specialisms. Those who specialise in new technology, an inherently complex and uncomfortably fast-moving field, are very few in Scotland and there is clearly a need here to build research capacity (Brown 2007). However, it is also possible to argue that technologically-inclined academics are partly themselves to blame in having colluded with an alliance of advertisers, journalists, educationalists, and technology companies, a so-called 'technological-educational complex' (Buckingham *et al.* 2001). If this line of argument is correct then the normally critical discourse of the academy has been subverted by a discourse of marketing ('selling the digital dream') that principally serves commercial and political vested interest.

Since Glow is managed by LTS, this organisation has a special responsibility to ensure that the project obtains and uses critical feedback. However, only talk of 'benefits' is visible in LTS publications. Why should this be? One possible explanation is that LTS has presented the project as one that crucially underpins Curriculum for Excellence, an idea that seems to have been politically endorsed at ministerial level (LTS 2007). Conceivably, the stakes around Glow have been raised so high that risks and threats are practically unmentionable. This may also explain why the project has favoured a particular type of consultant. Whereas academics are barely visible in that role, the prominence given in particular to the ubiquitous technology evangelist Stephen Heppell could hardly be greater (www.heppell.net; O'Donnell, 2008). But the most important factor may be that of Glow's current staff, around half are directly employed by RM, the IT company that gets paid for building the project's software (LTS 2008e). Although supporters of PPP policy will view this arrangement as a natural and welcome consequence of partnership, others will fear that the impartiality of LTS's advice and the quality of its services are compromised by divided loyalties. Fears of this kind have certainly been expressed in relation to other PPP projects, for example those involving new buildings for schools and hospitals (Herald 2008; BBC 2006).

The education bloggers should really be the subject of a separate research study devoted to that phenomenon. However, even a brief review is enough to reveal that in Scotland the blogging group, although not homogeneous, exhibits an enthusiasm for Glow that is often uncritical or naive. An illustration is as follows. In 2007, the former director of Glow left LTS to take up a post with Cisco Systems, the multinational telecommunications company. Cisco has supplied Glow with some of its most important hardware components (Buchan 2005). Cisco has also supplied hardware for the 'Great Firewall of China' and over a long period the company, together with others including Microsoft and Sun, has been criticised by Amnesty for its alleged role in the censorship of the internet in China (Amnesty 2008). Cisco has denied any wrongdoing but even so, in these circumstances, the Glow director's career move might have seemed interesting enough to generate discussion on the blogosphere. However, a search of postings reveals almost nothing other than congratulation. One education blogger wrote:

I recieved a comment on my blog the other day from [director's name].

I haven't met [director's name] but he has commented on my enthusiasm for GLOW via my blog a couple of times. I have also heard [LTS staff member's name] talk about him in only the highest of terms. [director's name] is leaving the public sector and going to work for Cisco. His role initially will be to develop a comprehensive vision for the future of technology in education in what Cisco term their "emerging nations" which include South America, Africa the Middle East and Eastern Europe. I wish him good luck and as one of the key people responsible for operating the switch that will enable GLOW to light up learning in a revolutionary way I am sure it won't be long until these emerging nations are similarly illuminated. (Posted 1/12/06, accessed 28/8/08, original spelling preserved).

Why are the bloggers so one-sided in their discussion of Glow? Quite a few of them are LTS employees, Glow mentors, or have other work-related commitments to the project. Also, technology enthusiasts are probably over-represented in every field of blogging, reflecting the medium's technical origins. 'Echo-chamber' effects, in which bloggers write mainly for one another under a presumption of shared beliefs, are commonplace. Sceptics who venture into this territory risk ridicule and even abuse, as this writer has experienced at first-hand (an archive file of the relevant web encounter is held by the author). Bloggers often provide a 'blogroll', which is a list of other recommended blogs: it is an interesting exercise to follow these links and observe the extent of mutual admiration that is revealed by the repetition of names.

CONCLUSION AND FUTURE RESEARCH

David Edgerton has argued that in the history of technology, too much attention is generally given to innovation (and invention) and not enough attention is given to use (Edgerton 2006). Episodes of innovation are eye-catching but brief. In a technology's lifetime, it is the (typically far longer) period of use that enables us to judge the technology's usefulness, significance, and pervasiveness. Most change is not the result of innovation but takes place by the transfer of techniques from place to place. Unfortunately, in the case of Glow the period of use has hardly started and so this paper has necessarily focussed on innovation. Studies of the technology in use will be essential future research.

Whatever the intended outcomes of Glow, the use of the technology will be crucially mediated by teachers. Theirs is the most significant 'missing voice' in this paper. Although LTS literature has often claimed that consultation with teachers has been extensive, the visible evidence for this claim seems thin and teachers' views on, and experiences of, the project remain largely unknown. When and how were the major policy alternatives (i.e. of the kind set out earlier in Table 2) discussed with teachers, for instance? To what extent have teachers been made aware of the risks and threats that come with Glow, such as the risks of project failure, managerialism, inequity, cultural trivialisation and surface change? In what ways have teachers actively participated in the process of Glow's software development? These are all important questions for investigation.

An interesting possibility will be to use the Glow experience as a testbed for existing theories of educational research. For example, it has been suggested that the teachers who will use new technology creatively are those whose teaching philosophies are already distinctively constructivist (Becker 2000). Also, other research has concluded that a process of 'technification' of education is underway, which alienates the majority of teachers whilst a minority with claims to special technical knowledge and skills assume a privileged role in the development of pedagogy (Spector 2001). Future research could usefully test such theories in the context of Glow.

In conclusion, this paper has explored the 'the dark side of Glow'. The motivation for doing so is not one of simple pessimism. It stems instead from a belief that teachers and parents ought not be forced into making a false choice between two

extreme alternatives: an irrational-exuberant view of Glow, on the one hand, and a neo-Luddite refusal to have any engagement with it, on the other. There is a better, third choice: to develop a balanced discourse of reflective scepticism. Such a discourse acknowledges that Glow offers many potential benefits, but also comes with opportunity costs, risks, and threats. Unless the latter can be identified, they can hardly be addressed and mitigated. At present, the lack of balance in the discourse not only reflects badly on the quality of critical thinking in Scottish education but also increases the likelihood of unwelcome outcomes. Neither is it healthy that the new technology is being developed within a culture that seems to prefer conformity to debate. Technologies, like ideas, need to be tested under pressure of conflict. To paraphrase Nietzsche: 'what doesn't kill them makes them stronger'.

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