

Final report

## **DCMS**

### **BBC Online review – module 1: Assessment of BBC Online's use of technology**

20 April 2004

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## 1 Summary of findings

This section summarises the findings from each section of this paper. All evaluations and conclusions are based on information provided by the BBC, interviews with technology suppliers and online service providers, and desk research. It should be noted, however, that the availability of data in the area of Internet technologies and associated costs has been limited.

### Technical appraisal of BBC Online

BBC Online is one of the most wide-ranging and popular online services in the UK<sup>1</sup>. This is, in part, a result of how the BBC has used technology both to construct a highly diverse and dynamic set of websites and to offer users a range of engaging and easy-to-use online services. In nearly every aspect of its service, from its site infrastructure and design to its audio and video streaming services, BBC Online has developed and implemented, either through in-house expertise or through external procurement, a high quality and robust technical solution.

The expenditure on the development and on-going maintenance of BBC Online's technical operations seems to be broadly in line with their scale and technical quality, based on comparisons with other online players – although, in specific areas (site infrastructure, distribution and content management systems), on-going costs have risen over time and may benefit from a thorough review and rationalisation.

A full technical appraisal of BBC Online's services is provided in section 3.

### Impact of technology on BBC Online's performance against purposes

BBC Online's use of technology has helped it to develop online services that effectively meet some of the service conditions of its Approval<sup>2</sup> – in particular:

- to provide “useful, stimulating and up to date content (in the fields of news, current affairs, public information, education, and regional and local community information)” – through the development of engaging interactive features within the relevant sites
- to provide programme-related content and feedback channels – through the provision of live and archived TV and radio material that could be streamed to the user over the internet, as well as the development of programme-related message boards, chat rooms, and forums
- to “enable communication, exchange of ideas and experience within communities” – through the development of online messaging services and community sites (such as iCan)
- “to act as a trusted guide to the new media environment” – through the development of an intuitively designed and user-centric site which has been harnessed effectively with the BBC brand, along with the application of BBC editorial standards both to BBC Online content and to a specially developed web search tool

Beyond this, however, BBC Online has also deployed technology to strengthen its competitive position in relation to the rest of the new media sector (including commercial players) in a manner that could be seen to be at odds with the spirit and the letter both of its 1998 Approval and its wider remit as a public service broadcaster, in the light of:

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<sup>1</sup> BBC.co.uk websites rank as the fourth most popular in the UK with 4.3m visitors per month. Microsoft sites (including MSN) are top of the list followed by Google and Yahoo. Nielsen (NetRatings 2003)

<sup>2</sup> BBC Online approval from DCMS 1998

- its ambitious development of content services and related technology-based applications in areas that are not explicitly specified by, or extend beyond, its 1998 Application or Approval (e.g. its entertainment message boards and games)
- its partial failure to act as an “independent and trusted guide to the Web”, as a result of its use, in some cases, of technology-based features to help retain users within the BBC Online site, rather than direct them around the wider web (through the development of a web search tool that encourages users to stay within the BBC Online domain rather than venture onto other non-BBC sites); and as a result of the absence of related links to relevant third party commercial sites

Section 4 provides an assessment of the impact of technology on BBC Online's performance against its purposes.

### **Impact of use of technology on online supplier market**

Beyond its own internal development teams and its relationship with BBC Technology, BBC Online has only worked with a small number of other external technology suppliers. There is limited evidence of a commitment to share both the acquired skills and the physical products (e.g. software, code, standards, best practise etc.) of its online technology expertise.

BBC Online's approach to investment in and development of new technology-based services has been essentially competitive rather than collaborative. Over the past five years, BBC Online has indubitably helped to develop and define the market in a range of technology-driven service areas, including audio and video streaming, broadband content services, and interactive learning services. In each of these areas, however, it has continued to operate in direct competition with would-be commercial providers, arguably reducing competitive commercial investment and provision.

The impact of the BBC's use of technology on online supplier market is considered fully in section 5.

## 2 Introduction

This paper provides an assessment of the BBC's use of technology in the provision of its online service ('BBC Online') since its launch in 1998. The assessment includes an appraisal of:

- The range and quality of technology implemented and developed as part of BBC Online's service
  - how good are the various technical solutions deployed by BBC Online, in absolute and relative terms?
  - could BBC Online's services be delivered (better or equally well) with different (or simpler) solutions?
- The impact of technology on BBC Online's performance against its purposes
  - how effectively has technology been deployed to enable a service that meets BBC Online's core purposes, as set out in its original Approval?
  - what has been the impact of technology on the end user experience?
- The impact of BBC Online's use of technology on the online technology and service provider market
  - what has been the scale of BBC Online's investment in the online technology supply market, through external procurement?
  - has BBC Online invested in or developed new technologies that it has then shared with other online operators (e.g. through sharing code, platform infrastructure or best practise)?
  - has BBC Online helped to develop the market in new directions, through its investment in and development of new online technologies and services?

Our methodology for assessing BBC Online's use of technology, in the light of the above questions, was based on an analysis of seven specific areas of technology that are central to the development and overall service offering of BBC Online. These areas are:

- Site infrastructure and distribution
- Content management
- Site design and accessibility
- Streaming audio and video
- Interactive functionality
- External web search
- Mobile applications

This paper sets out the results and conclusions of our analysis, considering each of the questions set out above in turn, drawing on our research into how BBC Online has used technology in each of the seven areas listed above.

All evaluations and conclusions are based on information provided by the BBC, interviews with technology suppliers and online service providers, and desk research. It should be noted, however, that the availability of data in the area of Internet technologies and associated costs is limited; data is often not consistent across different Internet sites and technical infrastructures and is, also, of a confidential nature. It has, therefore, been difficult to draw technology and cost-related comparisons between BBC Online and other (competitor) sites.

Appendix A provides a glossary of technical terms used in the report. Appendix B lists the parties interviewed for the purposes of this report.

### 3 Technical appraisal of BBC Online

This section provides an appraisal of the various technologies deployed by BBC Online across its overall service offering. As stated in the introduction, our appraisal sought to answer two questions:

- How good are the various technical solutions deployed by BBC Online, in absolute and relative terms?
- Could BBC Online’s services be delivered (better or equally well) with different (or simpler) solutions?

Whilst our analysis considered seven core areas of technology, below we provide detailed analysis of three areas that serve, in particular, to illustrate our findings in response to these questions. These are:

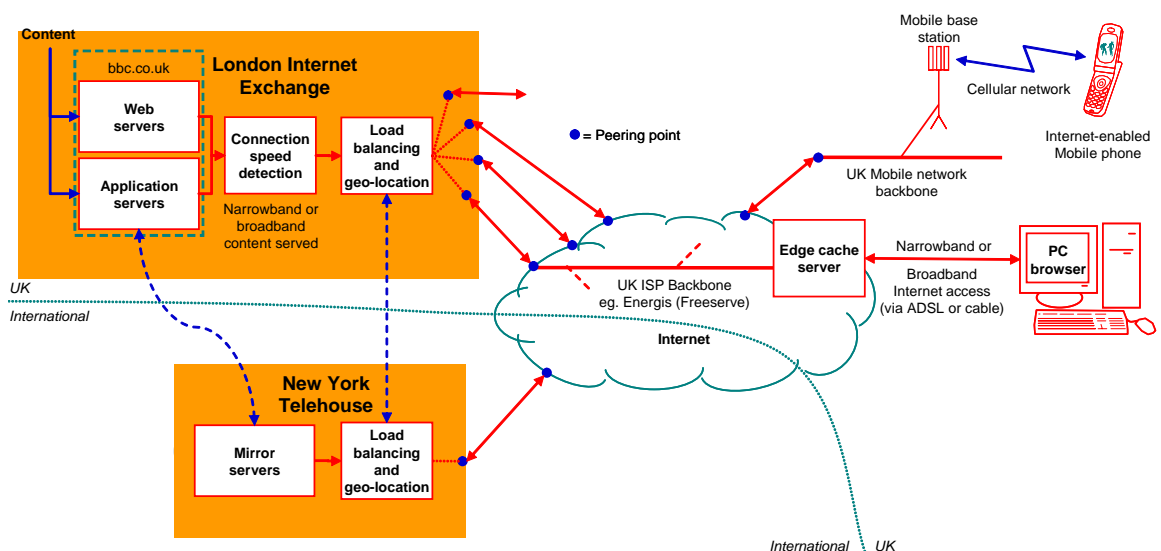
- Site infrastructure and distribution
- Audio and video streaming
- Content management systems

#### 3.1 Site infrastructure and distribution

The BBC is generally perceived to be at the forefront of the new media sector in its use of technology<sup>3</sup>, across both the Internet and interactive digital television media. The core site infrastructure and distribution of BBC Online represents good examples of how technology has been used to ensure high service quality, reliability and functionality. The cost of achieving this, however, has not been optimal, as described below.

The infrastructure has been developed on a bespoke basis from the 1996 launch of the first BBC presence online. The solution has evolved with the site and is now operated and managed by BBC Technology. The exhibit below illustrates the main features of infrastructure in the system.

**Exhibit 1: High-level schematic of BBC Online infrastructure and distribution**



The specific technical strengths of BBC Online’s site are:

<sup>3</sup> Opinion gathered during the interview process, supported by a number of submissions to the Graf review

- Peering arrangements: BBC is one of the few content companies that is a member of LINX (London Internet Exchange). Co-locating here is the best available location for the server farm as it is as 'close' to the public Internet as can be; the gross throughput of bandwidth to the end user is optimal as BBC Online peers directly with most UK Internet Service Providers (ISPs)
- Ability to manage large amounts of throughput and cope with the increasing demand from users: The load is continually growing and the system maintains its level of performance under this load (as a result of the 100% redundancy of the hardware and traffic load balancing between London and New York). Currently, the capacity of the infrastructure can be increased from a normal daily Internet bandwidth peak of 1.6Gbps to over 2.0Gbps (equivalent to serving 10,000 hits per second and around 50,000 concurrent streaming connections); this is a far higher capacity than other online sites<sup>4</sup>
- Speed connection detection: tools are in place to detect the speed of a user's connection to the Internet and to serve audio and video content accordingly. If the user is connecting via a broadband connection, then higher quality feeds are streamed<sup>5</sup>
- Successful distribution of a very large (currently 2.5m pages) site to users globally: Geo-blocking tools ensure that requests from UK users are serviced, if possible, by the London set-up. International traffic is routed through New York<sup>6</sup>
- Caching agreements with ISPs: arrangements have been put in place for UK ISPs to be able to cache BBC content on their network to enable faster service for users connecting through them (as indicated by the "Edge cache server" in the diagram above)
- Staff knowledge of the systems: the system has been maintained and operated by a fairly consistent team since its inception

Overall, the architecture of the site – and in particular, its access to peering points at LINX – enables BBC Online to deliver a very large amount of content to a large and disparate user base at high speeds, even at busy times, with very high levels of reliability.<sup>7</sup>

The total cost of the site infrastructure, provided by BBC Technology on an out-sourced basis, is £7.1m.<sup>8</sup> Based on interviews with Internet infrastructure suppliers and online competitors, this annual cost figure seems relatively high, even given the high specification of the system. This may be a consequence of several factors, for example:

- The system has evolved over time and it is likely that certain inefficiencies are due to the legacy of supporting older hardware and systems. A 'spring clean' of systems and architecture might remove these factors
- Intelligent content distribution (e.g. through content caching at ISP hosting centres close to the edge of the network) has only recently been introduced to reduce the bandwidth required to deliver services to a widely dispersed user base; this should help to reduce costs in future
- A failure, until recently, to ring-fence the infrastructure and distribution capacity (and hence the costs) required for service provision to UK residents (i.e. licence fee payers), leading to distribution costs being

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<sup>4</sup> One major UK online content site claims recent average service usage of 400 hits per second, using 6Mbps; the hosting infrastructure of another leading UK site requires an average daily bandwidth of 60Mbps to serve usage

<sup>5</sup> The detection of connection type is based on a list of IP addresses known to be in use by UK consumer broadband ISPs; the majority of ISPs offering consumer broadband services are registered on this list – although users who are not using one of these ISPs but are connecting through what could technically be defined as broadband (e.g. most office users) will only not be registered as broadband users and, so, will only get narrowband content

<sup>6</sup> The user will only notice that geo-blocking tools have been used by BBC Online when it suggests which version of the news front page a user should take. However, it is not technically possible to locate an Internet user geographically 100% reliably; the BBC is aiming for its geo-blocking service to be effective in 97% of cases within the next two to three years

<sup>7</sup> Reliability statistics detailed in 'BBC New Media performance dashboard', Oct 2003

<sup>8</sup> Internet operations charges for 2003/4, BBC New Media and Technology data submissions, December 2003

driven up by international users. The geo-blocking feature, described above, is now used to identify these users and all incremental network costs are paid for by the World Service's grant-in-aid

When comparing the data from BBC Online with that of other web content providers, the sheer scale of the BBC operation becomes apparent. As the table below illustrates, BBC Online's average daily bandwidth per hour is significantly larger than two other leading UK online content sites. The scale of BBC Online translates into a low unit cost of bandwidth, although the difference between BBC Online's unit cost of bandwidth and that of other much smaller sites is not as great as might be expected.

**Exhibit 2: Comparison of infrastructure data and cost**

Company	Daily bandwidth per hour		Hits per second		Approximate cost of bandwidth	Unit cost of bandwidth (£ per Mbps)
	Average	Peak	Average	Peak		
BBC Online	1.6Gbps	2.0Gbps	10,000		£2.4m per year	£0.0015
UK site 1	100Mbps	400Mbps		1,400 <sup>9</sup>	£200k per year	£0.0020
UK site 2	6Mbps	74Mbps	400	1000	£120k per year for bandwidth and hosting service	£0.0200

**Source:** Information submitted on confidential basis by leading UK Internet sites to review team

### 3.2 Audio and video streaming services

It should be noted that the provision of streaming services is a relatively technically complex process and, as a consumer proposition, constitutes a new and innovative technology-based service. In this context, BBC Online's streaming services – in particular, its live and archived radio services – should be recognised as one of the most impressive and popular offerings in the market place.

The architecture and design of the BBC's streaming services are described and assessed in this section, along with potential downsides of the system and cost implications.

Based on a strong relationship with its streaming technology partner, Real Networks, BBC has developed advanced and intuitively designed streaming functionality<sup>10</sup> for live and archived content across all of the BBC's TV and radio channels. It has also worked closely with Real to develop its server software to improve the efficiency and reliability of its performance.<sup>11</sup>

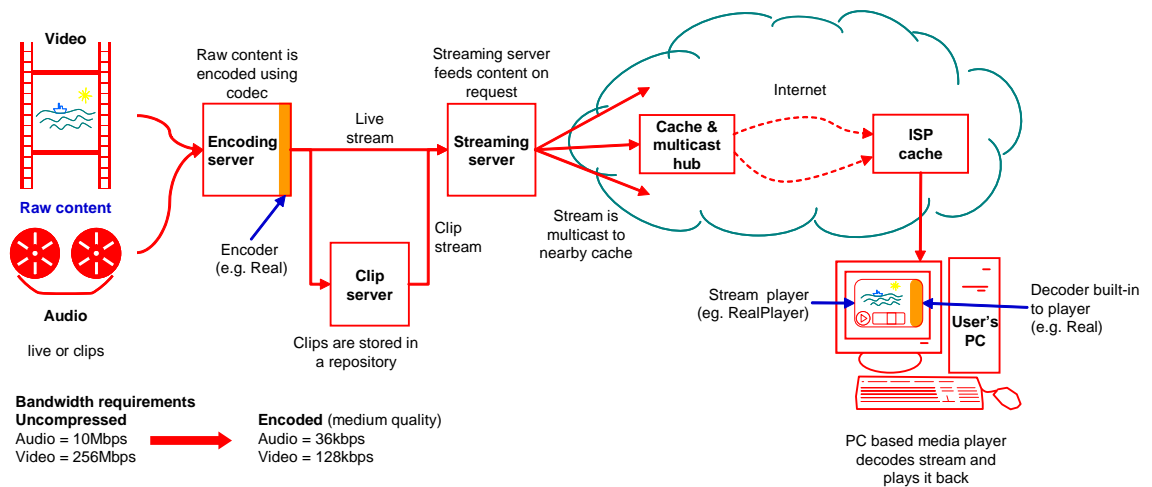
The illustration below outlines the basic process of streaming audio and video across the Internet. BBC Online manages the process up to the edge of the Internet, where it becomes the responsibility of the ISP to distribute the traffic to the end user.

<sup>9</sup> Calculated from specification of 1 million page impressions per hour, assuming 5 hits per page impression

<sup>10</sup> Spectrum opinion, based on interview responses from online competitors who provide streaming

<sup>11</sup> Based on interview with Real Networks streaming division, December 2003

**Exhibit 3: Schematic of streaming service**



As most of the BBC Online’s audio and video content is encoded using Real, RealPlayer software has to be downloaded and installed on the user’s computer. Real provides BBC users with a separate download page for RealPlayer that is free from commercial messages (the default page heavily markets the subscription version of RealPlayer).

The need for first time users to download RealPlayer from the Internet is a weakness in BBC Online’s streaming services. The use of the Real codec and the decision not to use the Microsoft Windows Media player and codec (the main alternative streaming technology to Real) may be discouraging users from accessing the BBC’s streaming services for several reasons:

- RealPlayer is an additional piece of software on top of the basic computer operating system and has an unfamiliar user interface that could cause confusion to inexperienced users
- Users may be averse to downloading new software or put off by the download time or cost (this would not be the case with Windows Media player, as it is pre-installed on any computer with a Windows operating system - i.e. the vast majority)<sup>12</sup>
- Users may already be accustomed to using the Windows Media player (especially if it is pre-installed on their PC)
- Users may have an alternative preferred player (e.g. Winamp, Sonique, Quicktime, Windows Media player) and may, therefore, choose not to use RealPlayer

Given these technology barriers to the use of BBC Online’s streaming services for a potentially significant number of users<sup>13</sup>, it is recommended that BBC Online carries out an analysis of the incremental costs (for example, of additional hardware and infrastructure, as well as the cost of the extra time to manage the content in both formats) and benefits (i.e. the incremental user reach) of offering streaming services in the Windows Media codec, as well as, or in place of, the Real codec<sup>14</sup>.

<sup>12</sup> One leading streaming services provider cites this as the major reason why it uses Windows Media over Real for its streaming services. It should be noted that BBC is considering using Windows Media for some of its future video streaming services

<sup>13</sup>“A significant number of users are discouraged from using BBC Online streaming services because of the RealPlayer download”, informal interview with BBC Online employee

<sup>14</sup> The BBC has already been trialling the use of an open source audio codec called Ogg Vorbis. This codec can work in any player but requires a small plug-in file to be downloaded before the first use.

BBC Online has begun testing some services with Windows Media Player. Its new digital radio services (1Xtra, BBC6 and BBC7) are available and it is also considering using Windows Media Player for future video streaming services<sup>15</sup>.

In general, the BBC has managed the cost of its online streaming services effectively. Its position as a key client for Real Networks has put it in a good position to get the latest software developments and service enhancements that best utilise the infrastructure and hence minimise costs<sup>16</sup>.

As the volume of demand for audio and video streaming rises, however, BBC Online will need to manage its bandwidth requirements and costs very carefully. Multicast technology is crucial to reducing the cost of the bandwidth required for streaming. To date, BBC Online has not fully utilised this technology, increasing the costs attributable to streaming (distribution costs increased by 35% between 2001/02 and 2002/03, mainly as a result of the increased demand for streaming services<sup>17</sup>) – although it is now initiating technical trials with ISPs, with a view to migrating live streams from unicast to multicast; this movement is welcomed.

Streaming services also, potentially, generate significant incremental content repurposing, storage and distribution costs (much higher bandwidth is required for broadband content)<sup>18</sup>. The 2003/4 streaming and network costs budget for BBC Online is £2.4m.<sup>19</sup>

### 3.3 Content management systems

The quality of the technical solutions deployed across the BBC site is generally very high. However, BBC Online's forward planning of business requirements and associated technical specifications does not always appear, on the basis of the information submitted to the review, to have been as rigorous or as forward-looking as should have been possible. A consideration of BBC Online's approach to content management systems (CMSs) helps to illustrate this point.

The exhibit below is a simplified example of a typical content management system. Authors and editors generate content on terminals with editing facilities; their work is then published onto a content database (which catalogues and indexes the item) and subsequently published to the web, often with a template applied to the content to ensure a consistent look. The complete page is stored in the page cache until it is next changed. Rich media, such as images, audio and video, are stored separately from the content database and combined at the web server. BBC Online uses a third party media cache (Akamai) to provide extra capacity during busy periods.

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<sup>15</sup> Based on industry interviews

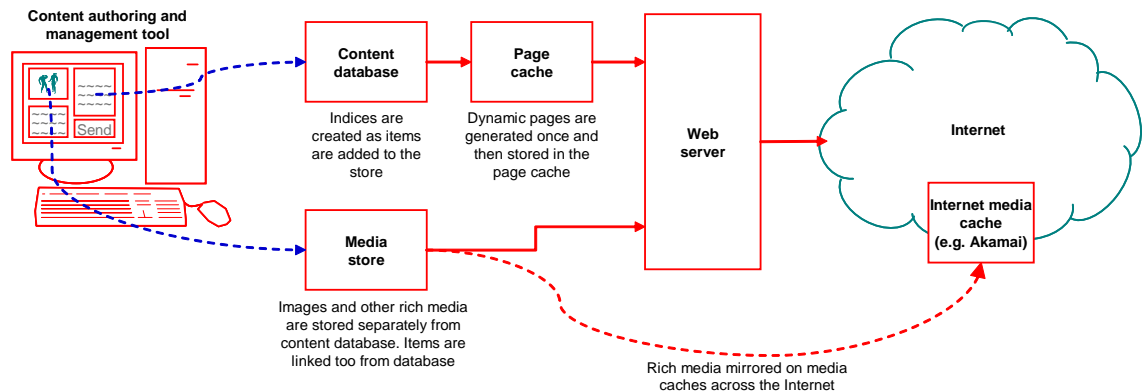
<sup>16</sup> Interviews with other content providers have suggested that Real is generally a more expensive option compared to Windows Media due to the server licensing arrangements however, BBC is likely to see large discounts due to the scale of its usage of Real

<sup>17</sup> BBC New Media budget submission 2003/04, p3. Actual direct streaming costs are not split out in the budget submission

<sup>18</sup> Interviews with competitors have emphasised that this is especially true when repurposing content for mobile devices. Each device manufacturer and mobile operator has chosen a different standard for rich media, requiring content developers to reversion and encode content multiple times for multiple devices.

<sup>19</sup> Includes "Networks and network hardware", "Real serving infrastructure" and "Windows media infrastructure" costs. Internet operations charges for 2003/4, BBC New Media and Technology submission

Exhibit 4: Example schematic of content management system



BBC Online uses a multitude of techniques to author, edit, store and publish its content, including:

- the bespoke content production system (CPS) used for its news and sports service (developed and maintained internally)
- a third party CMS, Documentum, recently procured for a particular part of the Nations and Regions site
- stand-alone static HTML pages – some created using design tools such as Dreamweaver, some even hand-coded
- a variety of other methods (e.g. bespoke Perl CGI programs)<sup>20</sup>

Given the relative immaturity of the medium, nature of BBC News content (e.g. volume and range of output, and speed of delivery,) and the need for the CMS to be compatible with other BBC systems (such as news wires and broadcast systems), it is entirely understandable that the BBC Online news CMS has developed organically over the past five years and that this development has been carried out in-house, rather than trying to use external suppliers.<sup>21</sup>

The number and variety of methods for publishing content across its many other sites has, however, led to a relatively fragmented and inflexible content production process that consists of multiple CMSs that do not interface with each other effectively (instead, requiring considerable manual content rendering<sup>22</sup>).

The 2003/4 budget for maintenance of the core News Online CPS is £1.3m, and £1.4m for developing new CPS functionality, with total costs reaching £3.8m.<sup>23</sup> Interviews with major UK online content providers suggested that these costs are high on a relative basis.

A longer term view on CMS business requirements across all of its sites could avoid this fragmented approach and reduce a number of costs, including:

- **Staff:** highly skilled staff are required to create content and to be proficient with a range of systems and technologies. Streamlining content management could allow technical staff to be separated from content production staff

<sup>20</sup> Perl is a computer programming language that can be used to author server-side (CGI) programs for web sites, such as content systems

<sup>21</sup> This point is supported by an interview with another major news provider who uses more than one CMS. Their experience has shown that CMSs are not generic and should be purposed explicitly for the task in hand.

<sup>22</sup> "Our web production model has been principally achieved by recruiting staff to hand-build content" New Media Budget Submission 2003/4, p2

<sup>23</sup> Costs for CPS systems, BBC New Media and Technology data submissions, December 2003

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- **Time:** reduce time of indexing, cataloguing and archiving content across disparate systems. Content management systems are able to automate many of these processes
  - **Server technologies:** discrete systems are required to support all of the different content publishing techniques. Optimising the content management process would reduce the number of storage and hosting systems

A rationalised forward-looking CMS strategy (potentially, unifying and, even, outsourcing CMS requirements) could, therefore be more cost efficient in the medium to longer run.<sup>24</sup>

### 3.4 Conclusion

Overall, it should be recognised that BBC Online has, over the past five years, developed a service that has effectively deployed a wide range of technical solutions to support its service offering; this has ensured a service with high reliability and flexibility as needs have evolved over the past five years and, above all, with high quality and functionality for the end user.<sup>25</sup> The level of expenditure in technology reflects the quality of the technical solutions deployed and also the fact that BBC Online has been operating in an immature and rapidly developing market place.

As the market continues to mature and stabilise, BBC Online should aim to develop longer-term plans and to rationalise its technical solutions, wherever possible, helping to ensure that its services are being delivered using the most cost-effective solutions.

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<sup>24</sup> The need for this strategy has been intimated in a number of BBC documents, including the 2003/04 New Media budget submission, p12

<sup>25</sup> Spectrum opinion, based on interviews with competitors and submissions to the Graf review. Impact of technology is considered in more detail in chapter 5

## 4 Impact of technology on BBC Online's performance against its purposes

This section provides an assessment of the extent to which BBC Online's use of technology has served the purposes of BBC Online, as laid out in the DCMS's Approval in 1998, which were:

- "To act as an essential resource offering wide ranging, unique content"
- "To use the Internet to forge a new relationship with licence fee payers and strengthen accountability"
- "To provide a home for licence fee payers on the Internet and act as a trusted guide to the new media environment"

The manner in which BBC Online has used technology to help to fulfil these purposes, and its impact on the end user, is considered for each purpose in turn.

### 4.1 To act as an essential resource offering wide ranging, unique content

BBC Online offers a very wide range of services across many different content genres and online technologies, from message boards to intelligent teaching applications. The impact of technology in the provision of "wide ranging, unique content" has varied across the different parts of this purpose, as set out in the Approval, which are:

- "Providing useful, stimulating and up-to-date content"
- "Access to and guidance around a range of interesting and relevant web content, including acting as an independent guide to other sites such as Government, NGOs and existing regional sites"
- "User focused navigation and overall site design which minimises download times and maximises ease and speed of use, adopting new approaches as they are proven to have value"

#### a) "Providing useful, stimulating and up-to-date content"

The BBC has implemented a number of technical solutions that support core BBC Online content services. The degree to which they "provid[e] useful, stimulating and up-to-date content" is varying, as illustrated below.

The content production system (CPS) stores, manages and delivers online news and sport content. As mentioned in the previous chapter, the CPS was developed in-house with a highly customised specification, developed over time as online services grew. It has enabled the BBC to deliver news and sport quickly and effectively and in an attractive and stimulating online form<sup>26</sup>. The CPS has been core to the successful delivery of "useful, stimulating and up-to-date content".

BBC Online has also used a range of technical solutions to develop "rich and interactive educational content"<sup>27</sup>. One of the earliest developments, in 1998, was an interactive learning application that could remember where a user had reached in a courseware module; this has since been extended to allow users to review their activities and test scores across all of BBC Online's 'learning journeys'. At the time, this was a market leading application. BBC Online has used technology to develop a compelling service consistent with its consent, making usage easy and practical.

The BBC has also commissioned a range of interactive learning sites and applications (such as the Xchange site, developed by Victoria Real for CBBC). Overall, BBC Online has used a variety of technical solutions to

<sup>26</sup> Industry opinion, gathered through interviews

<sup>27</sup> "Review against the terms of the 1997 and 1998 approvals for the BBC's online service", Section 1.2

develop user-friendly and tailored educational services, helping to meet its core purposes, as specified in 1998.

Indeed, such is the range of technical solutions throughout its site that BBC Online has, arguably, developed and used technology in online service areas to a degree that goes beyond the scope of its 1998 application and approval – for example, on its entertainment, travel, and property sites.

- b) “Access to and guidance around a range of interesting and relevant web content, including acting as an independent guide to other sites such as Government, NGOs and existing regional sites”

Technology underpins specific features of the BBC's online service that provide “access to and guidance around web content”. As the following examples show, some of these features have been relatively recently implemented whilst other have not been as effective as possible at fulfilling this purpose.

BBC News Online now provides ‘intelligent’ related links (i.e. relevant stories) as a side bar in stories, based on the subject and context of the story in question (although BBC News Online provided some external links prior to implementing this functionality). This functionality, however, has been phased in over time and is significantly behind competing players who have been using intelligent related links for some time.<sup>28</sup>

Whilst BBC Online provides relevant and clearly signposted links to third party sites of Governments, NGOs and regional bodies on many of its sites, it provides significantly fewer links to relevant commercial third party sites (e.g. one leading online news provider reports that only a fraction of its incoming traffic (>1%) is referred to from BBC Online<sup>29</sup>).

BBC Online's search tool offers certain safety features – for example, filtering out content unsuitable for children, which may help to meet its purposes of acting as a “trusted guide” to the online environment (see section 4.3 below). Arguably, however, it fails to provide comprehensive access and “independent” guidance to other interesting or relevant online services as it is designed to return search results for a range of BBC sites ahead of external web sites. Results from external sites are on a separate page which is shown third behind a raft of BBC results (as shown in the screenshot below).

**Exhibit 5: Screen capture of BBC Online's search tool results page**



<sup>28</sup> For example: www.FT.com has been using intelligent related links for several years

<sup>29</sup> Review submissions, December 2003

At the beginning of 2004, the search results page for 'Results from the Web' was redesigned to move any 'BBCi Best Link' results to the right of the main search results, effectively moving other (non-BBC) search results higher up the page ('BBCi Recommends' links still show in the main list on the left).

In conclusion, whilst BBC Online has used technology in the form of related links and a bespoke search tool to improve "access to and guidance around" content on its own site, the manner in which it has deployed these solutions has limited its effectiveness as "an independent guide to other sites".

- c) "User focused navigation and overall site design which minimises download times and maximises ease and speed of use, adopting new approaches as they are proven to have value"

Overall, BBC Online provides an intuitive, fast and reliable service to end users. This assessment is based on the following considerations:

- The site infrastructure of BBC Online (as discussed in section 3) is designed to ensure both the quality and reliability of the service for online users through several design features, such as peering arrangements with ISPs which put BBC content as close as possible to the end user. Such technical features help to minimise page load times and enhance the user experience<sup>30</sup>
- The overall site design and accessibility of BBC Online has undoubtedly made the service easy to use<sup>31</sup>. Clearly structured and branded site design, carefully thought-through page lay-out, and simple, effective features (e.g. navigation) that are consistent across the service make usage intuitive and functional. The BBC has captured these design requirements in its Online Producers' Guidelines, which are available both internally and to third party producers
- A number of features are also in place to help users with visual or certain physical impairments to navigate their way around the site relatively easily. Every page has a "Text only" link which, when clicked, redraws the page, removing all of the graphics and other objects, leaving just the text. This feature uses an application developed by the BBC called BETSIE (discussed further in section 5.2) which also allows the user to change the colour and size of the text, as well as removing embedded items, such as games and applets. All BBC web pages have also been created so that the font size can be changed in the client's browser to make reading easier

Overall, the high technical specification of the infrastructure and distribution of BBC Online's service, together with its compelling site design and usability features, enable a site which is easy to use and reliable in its delivery.

#### 4.2 To use the Internet to forge a new relationship with licence fee payers and strengthen accountability

BBC Online is required by its 1998 Approval to use the Internet to strengthen its relationship with licence fee payers in two ways:

- "Provide opportunities for licence fee payers to feedback their views to the BBC on current and future programmes and services and to contribute content"
- "Enable communication, exchange of ideas and experience within communities and between those with shared passions and interests" (with particular reference to regional and local communities)

<sup>30</sup> Page load times are measured by a system called Gomez. Recent figures show the average page download time of the homepage is between one and two seconds and remains fairly constant, even when during busy usage periods

<sup>31</sup> Spectrum opinion, based on the responses from industry interviews with site accessibility experts

a) “Provide opportunities for licence fee payers to feedback their views to the BBC on current and future programmes and services and to contribute content”

BBC Online has delivered well on this purpose: some form of viewer/listener feedback has been available from the outset, as programme-related services were, collectively, one of the core tenets of BBC Online’s original service proposal in 1998, and initial basic email services have since been complemented by a number of other electronic feedback mechanisms. These include:

- programme-related message boards
- programme-related chatrooms
- site-specific web logs (known as ‘blogs’)

For each of these interactive services, users can post their own comments or simply read comments from others. Together, they provide valuable and extensive feedback channels to the BBC for all of its services – and have led to a significant increase in the volume of licence fee payer feedback (The BBC now receives about one million emails a week and user contributions now exceed one million a month<sup>32</sup>).

The current growth in web log usage and popularity also allows users to contribute content (e.g. to news stories) in the form of text, pictures, and audio and video clips.<sup>33</sup>

To ensure editorial standards are adhered to in the public sections of the site, the “acceptable use” policy of the BBC Online forums is visible on every page, as is the moderation policy. Some forums are monitored by BBC staff or are expressly set up to provide direct feedback to programme makers whilst other forums are pre-moderated (posts are checked before they are made visible on the site) by a third-party company called Chatmoderators Ltd.<sup>34</sup> The remaining forums are post-moderated (the posts appear on the site immediately, relying on users themselves to report offensive or inappropriate posts).

As a result of these services, BBC Online provides an important additional feedback mechanism for licence fee payers, as well as the opportunity for users to post personal content on the site in an organised and easy-to-use way.

b) “Enable communication, exchange of ideas and experience within communities and between those with shared passions and interests”

Particularly over the past two to three years, BBC Online has been very active in developing and implementing new communication applications, from programme-related message boards to news-related forums and debates. Technologies include:

- Howerd2 – a message board application developed for BBC Online by BBC Technology that is the engine behind the site’s forums
- DNA – an application server that was externally procured in 2000, providing a community message system where user generated content is categorised, reviewed and commented upon by other users.

Messaging and community-based services have grown in number and functionality and have been given increased prominence throughout the site – since 2001, a ‘Communicate’ link has been incorporated in the universal navigation bar at the top of every page (see section 4.3).

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<sup>32</sup> Review against the terms of the 1997 and 1998 approvals for the BBC’s online service, P86

<sup>33</sup> E.g. see ‘[http://news.bbc.co.uk/1/hi/talking\\_point/2780295.stm](http://news.bbc.co.uk/1/hi/talking_point/2780295.stm)’ for an example of how BBC News Online is able to incorporate relevant user-generated content into reports or stories

<sup>34</sup> All fora, including those moderated by a third party, are officially “hosted” by BBC staff members

In addition, BBC Online has recently launched iCan (using DNA technology), which allows users to make contact with other people regarding local and regional issues of social concern (e.g. public litter or mobile phone mast health risks); it offers users the ability, for example, to establish message boards and interest groups and to design and launch publicity campaigns (e.g. through online poster production).

As illustrated by these services, BBC Online has effectively used technology to offer users an increasingly wide range of opportunities to communicate with each other, either around general areas of interest or particular topics or events.

#### 4.3 To provide a home for licence fee payers on the Internet and act as a trusted guide to the new media environment

BBC Online has played an important role in driving awareness and take-up of the Internet amongst UK users within the context of a well-known, trusted and reliable brand and content provider. In market research carried out for the BBC, BBC Online was cited as one of the main reasons why 7% of UK users (some 2 million people) first accessed the Internet.<sup>35</sup>

To consider BBC Online’s impact on users’ attitudes towards technology and on their new media skills and knowledge in more detail, it is useful to distinguish between the different objectives specified in the Approval, which may be characterised as:

- Acting as an independent and trusted guide to the Internet
- Educating users about the Internet and helping them to develop the skills and ability to use it effectively

##### a) BBC Online as an independent and trusted guide

BBC Online has effectively established itself as a “trusted” Internet destination. This is, in part, because of the site redesign in 2001 and the addition of a web search facility.

The site redesign put in place a more consistent look and feel to the service – for example:

- the addition of a universal navigation bar (as shown below) at the top of every page, including links to the major section indices, allowing navigation back to the core site areas (e.g. TV, Radio, Communicate)
- implementing a single lay-out design which places a navigation bar on the left-hand-side of most pages

**Exhibit 6: BBCi universal navigation tool bar**



In addition, the new external web search functionality (as discussed in 4.1), updated in 2002, provides a safe and user-friendly interface to BBC Online’s sites and also to the wider Internet. The web search is incorporated into BBC Online’s home page and the universal navigation bar (as can be seen on the right of the screenshot above). The search process is similar to most other search engines available on the web (i.e. type in a word or phrase related to your query and click ‘Go’ to see the most relevant search results). Additional features, such as providing a ‘BBC editorial standards’ filter and giving priority to UK-centric sites, offer the user further means of making the process of Internet surfing safe and productive.

<sup>35</sup> ‘Public service in an online world’, BBC submission to DCMS, July 2003

This 'safe' Internet search tool could, however, limit an Internet user's horizons, as it directs users primarily to BBC sites. The search tool has been designed and implemented so that search results, for any given term, are presented to the reader, first from "All of the BBC"; second from "BBC News" and finally "Results from the Web" (the user must actively click through to the third set of external web results). Even the first results from the "Web" are frequently "BBCi recommends" sites, what are primarily BBCi sites.

It is not clear that such a BBC Online-centric search tool acts either as an "independent" guide or that it serves the purpose of being a trusted guide to the wider web, promoting the education of users in the wider Internet environment and its capabilities. Rather, the web search tool helps BBC Online to be a user-friendly and trusted guide, primarily to its own services, whilst in some ways hindering rather than aiding the process of searching the wider web from the user's point of view.

It should be noted that commercial portals, such as AOL, provide user-friendly search tools to the Internet which also have simple and effective content filters that can be customised by users. Many other sites run search tools with the search technology and database supplied by third parties such as Google, Overture or Inktomi.

Overall, given these considerations, it is arguable whether BBC Online's web search service (currently supplied by Inktomi) is sufficiently distinctive from other search sites to help the service meet its core purpose as an "independent and trusted guide to the Web" and whether the results it provides are appropriately weighted between BBC and external sites to be an effective independent guide to the wider (UK) Internet.

### b) Educating users about the Internet

BBC Online offers a very wide range of content services and applications, making use of a number of different technologies of varying levels of sophistication. Services range from basic content in graphic and text format and simple email and messaging services to more complex music composition applications, interactive games (e.g. Fightbox) and learning applications (e.g. Xchange).

The diversity and range of different technologies deployed within the BBC Online service provide a very good introduction to the (interactive) capabilities of the Internet. The easy navigation around the service and the wide usage of different types of applications within many parts of the site mean that 'novice' users soon become aware of the variety of available online tools. Nearly all services (e.g. Audio on Demand player) are accompanied by clear user guides and intuitively designed user interfaces which helps BBC Online to provide an open and effective learning environment for "inform[ing] users about the implications of new media capabilities" and "enabl[ing] users to develop the skills, confidence and understanding they need".

The impact of BBC Online as a forum for learning about new media capabilities could, perhaps, be further enhanced to encourage users to progress from simpler interactions (e.g. casting a vote), to more advanced services (e.g. contributing to a discussion forum). It could do this by, for example, highlighting to users (following an 'interaction') what they have achieved, what else (e.g. related services) is available to them, and how to participate.

BBC Interactive Factual and Learning operates technology that plots the path of users through the site, as they are taking an online course, enabling them to return to the course where they left off. iCan also offers this kind of technical functionality, by offering a "what you've been looking at" section at the bottom of every page and then recommending related sections. Given the sheer size of BBC Online's overall service and the range of technologies deployed, it could further enhance the new media learning experience on offer by extending such functionality across all of its sites.

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### 4.4 Conclusion

Overall, BBC Online has deployed a range of technologies to support and drive its service offering; these technologies, ranging from interactive learning tools to on-demand audio-video streaming, have served to improve the accessibility and quality of the user experience of online services (including those not originally specified in its 1998 Application and Approval, such as entertainment).

Technology has also underpinned BBC Online's efforts to "use the Internet to forge a new relationship with licence fee payers and strengthen accountability". New programme feedback channels, from basic email to chat rooms and SMS surveys, have generated more feedback from a wider range of licence fee payers. Its community user-generated content sites, such as Weblogs and the iCan site, have "enable[d] communication [and] exchange of ideas and experiences".

BBC Online has, however, been less successful in acting as a trusted and independent guide to the Internet; this is in part a result of the way it has used online technology. Whilst deploying intelligent related links to direct users to relevant parts of the BBC Online Service, there have only been a relatively small numbers of links to related sites of commercial operators, although links to relevant public bodies are often provided. Similarly, BBC Online's web search function acts as an excellent tool with which to navigate around the BBC's own service, but is not designed to facilitate surfing of the wider internet.

## 5 Impact of BBC Online on the online technology and service provider market

This section assesses the impact of BBC Online's use of technology at three levels:

- what has been the scale of BBC Online's investment in the online technology supply market through external procurement?
- has BBC Online invested in or developed new technologies that it has then shared with other online operators (e.g. through sharing code, platform infrastructure or best practice)?
- has BBC Online helped to develop the market in new directions through its investment in and development of new online technologies and services?

### 5.1 Investment in the online technology supplier market

For all technology requirements, BBC Online either develops its own (bespoke) in-house solution, using its New Media technology team, or procures a solution from an external third party provider. Based on our discussions with BBC New Media and online technology suppliers, we understand that BBC Online has developed the majority of its solutions in-house. Of the seven technology areas considered (as listed in the introduction), these include:

- content production system (CPS) for its online news and sport services
- the majority of the site design and usability requirements
- many of the interactive services (learning tools, messaging applications, and games)
- mobile application development

Of its external suppliers, BBC Technology (BBCT) has been by far the largest supplier of technical solutions and service provision to BBC Online since the service's inception. Its annual supplier contract is worth approximately £7m<sup>36</sup>, providing BBC Online with all of its hardware storage, peering locations, network distribution and bandwidth provision, audio and video encoding, hosting and streaming capabilities, and all necessary technical support (as covered in section 3). It also provides BBC Online's core forum application 'Howerd2'.

The scale of the provider relationship with BBCT is, in part, a function of BBCT's own recent history: BBCT was still part of the public service BBC when it began supplying BBC New Media; it has since been hived off as a commercial operation under BBC Ventures (it was announced in late November 2003 that the BBC is looking to sell BBCT).

The actual terms of the relationship, however, between BBC Online (as part of the New Media division) and BBCT remain somewhat unclear. The relationship between the two parties is certainly strong, based on informal interviews with BBC and BBCT employees, but the cost structure of the contract between BBC and BBCT is not transparent and, possibly, at odds with margins achieved in the wider technology supplier market.<sup>37</sup>

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<sup>36</sup> Internet operations charges for 2003/4, BBC New Media and Technology data submissions. This figure is broadly in line with the value of the contract in 2002/03

<sup>37</sup> BIPA submission to Graf review of BBC Online, 24 November 2003, p19-20. Claims that BBCT operates on a 3% margin which, they claim, is exceedingly low compared to independent companies

BBC Online has also used a range of other third party technology providers for different business requirements, including:

- Nations and Regions 'Where I Live' CMS (Documentum)
- some of its interactive learning services (e.g. Victoria Real for 'Xchange')
- messaging services (e.g. DNA technology, to support its community discussion service)
- its web search tool (Inktomi)

The total value of these investments in 2002/03 is estimated at approximately £1.5m<sup>38</sup>, out of a total estimated annual investment in technology by BBC Online of £17.2m.<sup>39</sup> The largest non-BBCT third party procurement seems to have been for the Documentum CMS, where non-staff development costs were £800,000.<sup>40</sup> In contrast, based on data from interviews with major UK online competitors, other operators have outsourced a much higher proportion of their technical requirements, including hosting and distribution, site design and content management.<sup>41</sup>

In conclusion, BBC Online has procured a relatively low level of technology solutions from third parties other than BBCT. In the last three years, tenders held for new technical requirements have, on the whole, been for relatively small scale solutions, such as specific interactive learning content and individual one-off games.

### 5.2 Investment in shared technology development

There are a number of areas where the BBC could share its market-leading technical solutions and expertise with smaller, less well resourced players. Whilst the reality of sharing technology with other operators can be complex, there is limited evidence that BBC Online has made a sustained effort or commitment to do so.

Within the technology supply sector, there is an online community in which operators from all parts of the communications and IT sectors make specific applications or software developments available for other players to use. The prime example is Linux, a complete "open source" PC operating system, developed by a community of developers on the Internet which is free for users to download. As a non-commercial player, the BBC should be strongly placed to invest in the development of new technologies (which it requires for its own strategic purposes) which it could then make available to the wider market, in a similar manner to Linux.

To date, there has been only one instance of BBC Online actively contributing to the "open source" community – an accessibility tool called BETSIE was developed by BBC Online to enable text within web pages to be adapted in size to suit the needs of visually impaired users (as mentioned in section 4.1). This application has been made freely available to the World-Wide-Web Consortium to assist in its campaign to make web accessibility more widespread; it is currently in use on a number of Internet sites.<sup>42</sup>

BBC Online has also made various 'patches' (small pieces of software developed for very specific purposes) available to the online community, including 'WXPerl' and 'XML::twig'. In general, however, such patches tend to be of limited commercial use to third parties, as they designed to support particular online environments.

Given, however, BBC Online's significant ongoing commitment across its customer proposition to developing and utilising its own cutting edge (but not 'bleeding edge') technologies, there are likely to be opportunities for BBC Online to share its technical experience and knowledge, thereby making a real contribution to the UK

<sup>38</sup> Spectrum analysis based on BBC data

<sup>39</sup> New Media and Technology budget 2003/04, p5, p8 (based on assumed split between iTV and web)

<sup>40</sup> Costs for CPS systems, BBC New Media and Technology data submissions, December 2003

<sup>41</sup> Several leading UK websites interviewed outsource between 75% and 90% of total technology spend

<sup>42</sup> BETSIE has been implemented on a number of non-BBC sites, including DTI, Suffolk County Council and British Antarctic Survey

online market. For example, in the area of interactive learning tools, where many commercial operators are designing and developing services, there could be scope for the sharing of the pioneering learning applications developed by BBC Interactive Factual and Learning since 1998. BBC Online could also share with independent online content or programme producers, its knowledge and experience in developing programme-related content services and applications.

### **5.3 Investment in development of technology-led commercial market opportunities**

Whilst BBC Online has helped to drive the development of new online technologies, it has, in certain cases, arguably served to discourage commercial investment and ultimately hindered the development of a more diversified and sophisticated competitive marketplace.

Interviews with other major online content service providers have confirmed that BBC Online is seen as proactive in investing in, and developing, new online technologies and services across many areas of its business. These developments have often led the market, both in terms of the technical specification of the service offered and in driving user take-up. Streaming audio and video services are a good example of one such area.

BBC Online's role in helping to create commercially viable or attractive markets through its investment in and development of new technologies has, however, been less clear. Many competitors feel that, once the BBC has invested in a new technology-based service, and the wider market has developed, the BBC normally continues to operate as a full competitor to commercial players, rather than considering possible exit routes or developing a differentiated role in the market. This approach is seen as a significant disincentive to investment as the BBC continues to offer a free service – especially if it is a high quality service leveraging the BBC brand and cross-promoting opportunities.

A number of submissions draw attention to instances in which BBC Online has invested in new technology-based areas in the online market.

For example, in the field of audio and video streaming services, it is claimed that BBC Online's streaming services have had a negative impact on the commercial prospects and investment of third parties. During the late 1990s, a variety of commercial content providers began to invest in 'leading edge' technology development for commercially provided content services (e.g. ITN's mobile news service in December 1999), before eventually pulling out of the market, citing the presence of BBC Online, its heavy investment, and free service offering as being primary reasons.<sup>43</sup>

### **5.4 Conclusion**

To date, BBC Online's investment in the online technology supplier market has been limited, with under 10% of its total annual technology expenditure in 2002/3 estimated to have gone to third party providers other than BBCT (this figure rises to around 50%, including BBC Online's contract with BBCT).<sup>44</sup> This extensive use of in-house technology development, combined with BBCT supplied technical solutions, is understandable, given the time period being considered: the past five years have been a period of rapid development in an innovative market.

Nonetheless, the relatively low level of both outsourcing of technical requirements and services to the external supplier market and of sharing of established technology solutions and expertise raises two issues:

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<sup>43</sup> Interview with former Technology Manager at Sportal.com, December 2003

<sup>44</sup> Spectrum analysis based on the figures in section 5.1, including the value of the BBCT contract

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- Is BBC Online securing the most cost effective supply of technology solutions, given the economic advantages that a wider competitive supply market can offer?
  - Is BBC Online's investment in technology benefiting the wider online supplier market in a way that is consistent with its public service remit?

BBC Online's planned re-procurement process in 2006 for all services that are currently provided by BBCT will provide the opportunity to assess the full range of potential alternative solutions available in the supplier marketplace and to define its role in the wider development and usage of online technologies.<sup>45</sup>

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<sup>45</sup> For external procurement, BBC Online (as part of BBC New Media and Technology) is legally obliged to tender for services, according to the terms of the EU procurement process, in order to ensure a fair and open tender

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## Appendix A: Glossary of technical terms

<b>Internet</b>	A collection of many interconnected networks. The standard use of the Internet Protocol (IP) allows users connected to one network to communicate with users on another network. The common standards enable all users connected to the Internet to use services such as web browsing, file transfer, instant messaging and email.
<b>ISP</b>	Internet Service Provider. An organisation that enables companies or individuals to connect to the Internet. ISPs often provide e-mail capability, web hosting and other services in addition to connectivity. Large ISPs in the UK include BT, AOL, and Freeserve
<b>Backbone</b>	High speed network that connects the Internet points of presence of an ISP around the world
<b>Point of presence</b>	The physical location where an ISP's backbone circuits interconnect with the local lines of telephone companies. A Point of Presence usually means a city or location where a network can be connected to another one
<b>Server</b>	High-spec computer that is connected to a network and provides a range of services to other computers on the network, such as storing files, managing printers, encoding audio and video streams and hosting web pages  A server farm is a collection of servers physically located together
<b>Peering</b>	The connecting of two networks
<b>Cache</b>	A network server that stores copies of Internet pages and other objects as they are requested so that future requests for the same page can be served from the cache, rather than going back to the original site (assuming the original page has not since changed). A cache is implemented to reduce the load on the content provider's server and decrease the page load times for the user. If located on an ISP's network, it is often referred to as an edge-cache.
<b>Redundancy</b>	More than one piece of equipment, any of which could perform a given function. These multiple pieces of equipment are used to help improve the reliability and availability of the system. 100% redundancy implies there are two of every piece of equipment, the second ready to go in the event of the first failing
<b>Resilience</b>	The ability for a computer system to recover back to its steady state in the event of a fault or problem. Extra equipment such as backup and uninterruptible power supplies improve resilience
<b>Load balancing</b>	Fast servers or routers that direct Internet requests for content to different web servers within a server farm according to their respective load (i.e. how busy they are)
<b>Narrowband</b>	Internet access through a telephone line with a maximum speed of 56kbps.
<b>Broadband</b>	Internet access defined by being "always on" and faster than narrowband. Broadband products on the market today offer download speeds that range from

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128kbps to 2Mbps. Access technologies that provide broadband include ADSL and Cable

**Streaming**

The process of playing audio or video files over the Internet. Streamed files can begin to play while the file is in the process of downloading, eliminating the wait associated with other forms of audio and video playback in which the entire file must be received prior to playing

**Encoding**

The process of reducing the bandwidth and storage size required to distribute and store a piece of digital media by applying mathematical compression algorithms to it. Advanced encoders can compress data sufficiently to enable it to be economical to distribute it across the public Internet. Audio encoding techniques include MP3 and Windows Media Audio, video encoders include Mpeg 4, RealVideo

**Multicast**

A streaming technology that allows live streams to be effectively 'broadcast' over the Internet once and received by multiple users. Reduces outgoing bandwidth requirements for content providers

**Geo-blocking**

The technique of detecting where in the world an Internet user is physically based and basing the type of content they are served, if at all, on that information. Currently being deployed by the BBC to choose which News front page to show the user (UK or international). Geo-blocking systems are not 100% reliable yet and so cannot be used to block access to, for example, non-license fee payers (i.e. anyone outside the UK)

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## Appendix B: List of interviewees

a) BBC

Jonathan Kingsbury, Head of Editorial Affairs, BBC New Media and Technology

Richard Cooper, Head of BBC New Media and Technology

b) Technology suppliers

Nick Holland, Chief Technical Officer, DXI

Daren Norman, Director of Strategic Accounts, Real Networks

Gareth Sutcliffe, Windows Digital Media Division, Microsoft

Richard Pinder, Applied Psychology Research

c) Online competitors

Matt Bird, Technology consultant to AOL UK

Miles Runham, Director of Strategy, Ask Jeeves

Tom Laidlaw, Head of Technology, Capital Radio Group

Ave Wrigley, Technical Manager, ITN New Media

Mark Peatey, Head of Commercial, ITV Online

Rehan Sheikh, Head of Technology, Sky Online

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