

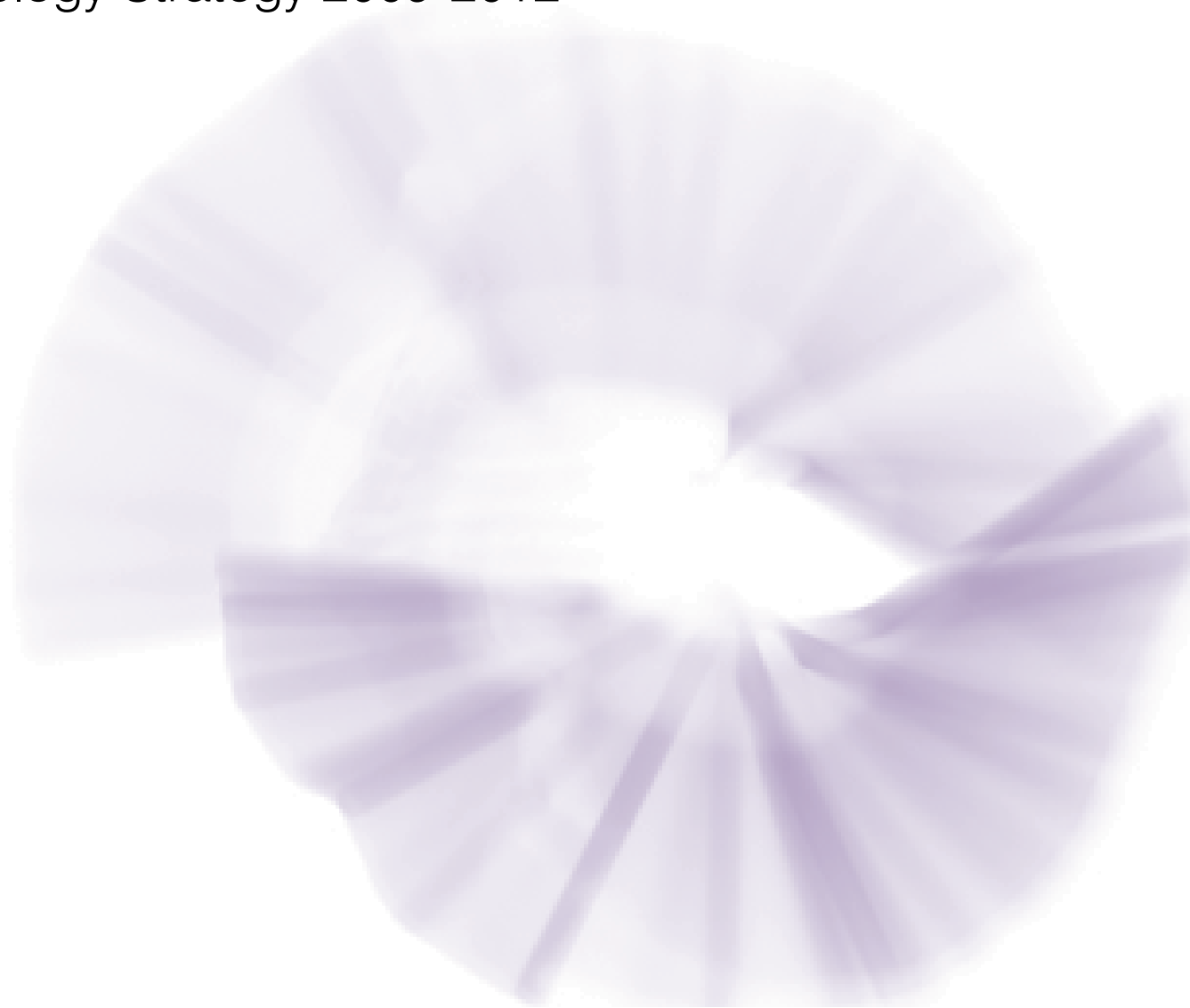
Technology Strategy Board

Driving Innovation



Creative Industries

Technology Strategy 2009-2012



The vision of the Technology Strategy Board is for the UK to be a global leader in innovation and a magnet for innovative businesses, where technology is applied rapidly, effectively and sustainably to create wealth and enhance quality of life.

Our three-year strategy for 2008-2011 is to drive innovation by **connecting** and **catalysing**. To achieve this we are focusing on three themes: challenge-led innovation, technology-inspired innovation and the innovation climate. For more information on the overall strategy see **www.innovateuk.org**.

We have identified a number of application areas and technology areas on which to focus, and for which we are developing specific area strategies.

This document presents the strategy for **Creative Industries**.

Foreword

It is our vision and ambition to make the UK a global leader in innovation. Our job is to ensure that the UK is in the forefront of innovation enabled by technology.

Our task at the Technology Strategy Board is to 'Connect and Catalyse'. As part of our challenge-led approach to innovation, we treat societal and economic challenges of the future not just as threats but also as opportunities for innovative solutions that enhance the quality of life and increase wealth.

The world is changing. Globalisation, digital communications and the growth of emerging economies present profound challenges to UK business sectors. Yet where there are challenges there are also opportunities. Open access to global supply networks and emerging markets is easier than ever before; the highly skilled workforce, world-class creative industries and science bases, and open-market philosophy also put us in a strong position.

The creative industries sector comprises a diverse number of market sub-sectors, from art, design, music, fashion and publishing through to computer games, the performing arts, film, TV and radio. What they all have in common is dynamism, driven by an open culture that embraces diversity, historic investment and, in recent years, technological development.

Technology has many roles – as a tool, technology aids the creative process; technology is integral to products such as video games; and increasingly, technology provides the route to market and the means to develop much closer, more direct, two-way relationships with an audience. Nowhere is the impact of technology more evident than with digital technologies, stimulating innovation across the value chain, and challenging existing market structures and business models.

At the consumer end, technology is driving convergence – where historically we had dedicated platforms and devices to watch TV, make telephone calls and access information, increasingly we are now able to access multiple services through a single device. For the creators, convergence is having a divergent effect. No longer is it just about producing a TV show for a particular broadcast slot; creators have to think about exploiting their idea on the internet and using technology to develop a more interactive relationship with their viewers.

This technological development has blurred the boundaries between different creative industry sub-sectors. Businesses and markets, which traditionally had little in common, now find themselves facing very similar challenges and need co-ordinated, cross-sector solutions. As a national overarching organisation, the Technology Strategy Board is well placed to enable and support cross-sector collaboration. These crosscutting opportunities are discussed in this strategy and will be the focus of our future investment.

Iain Gray
Chief Executive, Technology Strategy Board



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Executive summary

The UK is a world leader in culture and media, consistently in the top three achieving countries. Within the UK, the Creative Industries sector contributes over 6.4% of UK Gross Value Added and is growing at a faster rate than the economy as a whole. In 2007, total Creative Industries revenues amounted to some £67.5bn. The Publishing sub-sector is the largest, with Radio & TV and Advertising among the top performers.

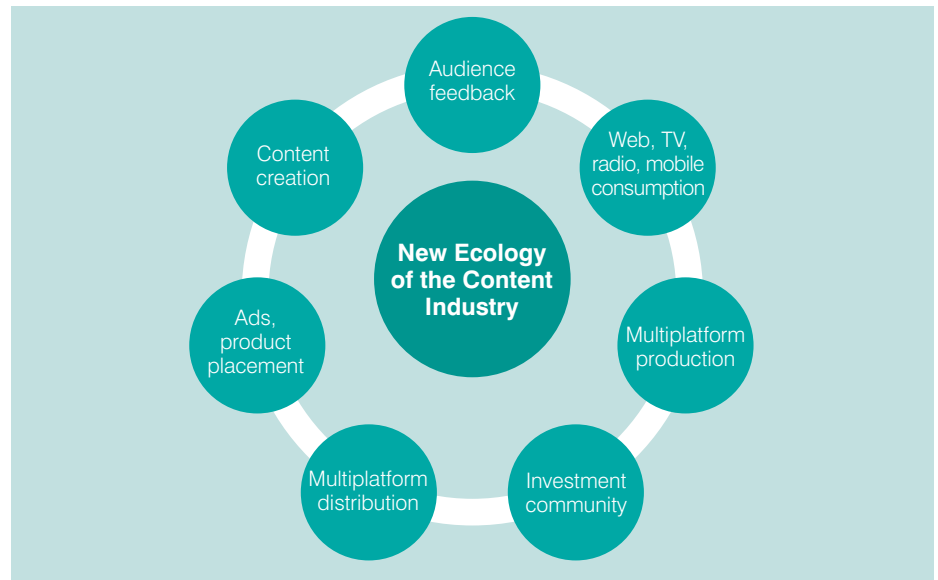
Key features of the sector are:

- It has many medium-sized, small and micro companies.
- The few large media businesses frequently provide the route to market for many smaller entities.
- There is a significant, publicly funded community including the BBC, Channel 4, theatre companies, museums and galleries.
- Its players, many of whom are freelancers, are often able to react with agility to new opportunities.
- The smaller companies do not frequently expand internationally.
- Many businesses find it hard to keep up to date with changing technologies and economic conditions.

New technology presents significant threats as well as very exciting opportunities for UK creative industry businesses. As digital technologies have developed, businesses using traditional business models and linear value chains from the analogue age are increasingly finding themselves ill equipped to succeed.

The internet is creating new, dynamic relationships between content creators, service providers and their audiences (Figure 1). It provides new routes to market and facilitates immediate feedback from consumer to producer.

Figure 1 – New dynamic relationships



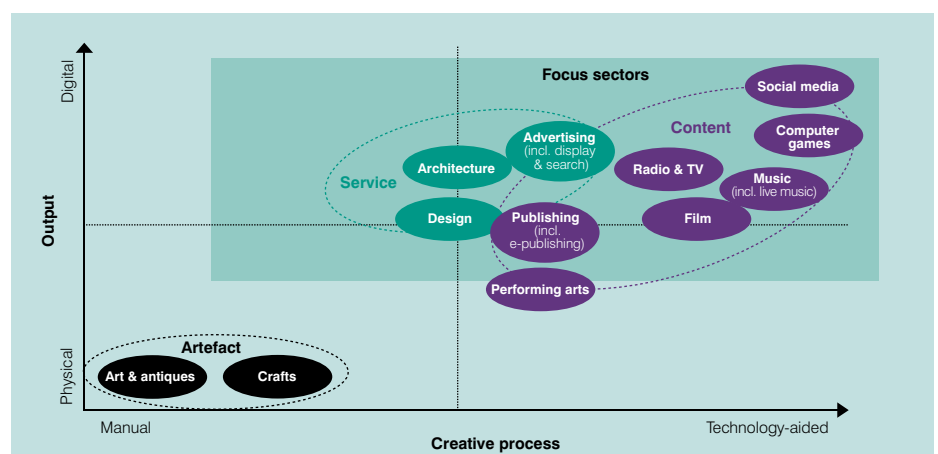
Segmentation

In this Strategy, we set out the Technology Strategy Board's analysis of the sector and identify those areas where we believe public interventions will bring the greatest economic benefit to the UK (Figure 2).

The Department of Culture Media and Sport identifies the following sub-sectors: Advertising, Architecture, Art & antiques, Crafts, Computer games and software development, Design, Fashion, Film, Music, the Performing arts, Publishing and Radio & TV. We analysed each sub-sector

by the extent to which the output is digital and to which its creative processes are aided by technology. Then we aggregated the sector into three broad markets: Content, Services and Artefacts. We introduced a new sub-sector called Social media to reflect the growth and importance of user-generated content and the platforms that enable it. We decoupled Software development from the Computer games subsector because the Technology Strategy Board's ICT Strategy covers it.

Figure 2 – Segmentation strategy



Key Priorities

We have found that 70% of the value and most of the growth potential of the Creative Industries sector lies in the Content and Advertising space. It is a space where technology is challenging well established business models and providing the spur to innovation and growth, and offers a significant prize upon which to focus.

The Technology Strategy Board has four key criteria for investment: size of the global market opportunity, UK capability and capacity to succeed, timeliness and the added value created by such interventions. It is clear that Content scores uniquely highly across all four criteria and therefore merits substantial focus. It is also, however, not without challenges.

It is now widely recognised that measures to prevent consumer copying of digital content are limited in both acceptance amongst consumers and capability to protect rights holders interests. As broadband and peer-to-peer technologies have grown, so has the problem of file sharing and this is only set to continue. This poses a significant threat to traditional physical sales models and standard digital distribution models.

Conversely, the growth of a variety of media platforms and the increasing digitisation of their networks opens up significant new opportunities for new products and services. Convergence of content across platforms and the increasing potential for interoperability between digital networks are broad trends that will progressively yield new value.

Technology convergence is blurring the boundaries between sub-sectors and creating both challenges and opportunities. The Technology Strategy Board has most to add by focusing on crosscutting areas.

The Technology Strategy Board will invest in applications and solutions that seek to open up new business models for creators and the creative industries to exploit these opportunities.

This strategy is aligned with several Government policy and funding initiatives: the Creative Britain programme, the Digital Britain report, the Research Councils' Digital Economy programme and the Intellectual Property Office's consultation on Copyright in the 21st Century. The Technology Strategy Board is well placed to play a key role as an enabler and implementer of technology elements in several of these programmes.

Based on our analysis and the broader policy context, our key areas of focus for the Creative Industries technology strategy are as follows.

1. Enable content data and meta-data¹ infrastructure development

The goal is to move towards the creation of content-aware networks that do not presume any single business model but anticipate new models beyond simple transaction-based or advertising-based methods of deriving revenue. In order to achieve this, we need a meta-data infrastructure in which intelligence about the movement, sharing, and consumption of content in a network can be tracked and analysed without compromising privacy and security.

¹ Here, meta-data includes authorship, provenance, rights positions, pricing, ownership, distributor, aggregator and licensee data, production information and identification of how, where, when and the context of content exploitation.

Technology Strategy Board will support or create programmes to:

- aid the development of shared standards for meta-data that address both the form in which the metadata is provided (syntax) and the vocabulary used to provide the metadata (semantics) in association with all forms of content or media;
- develop durability, persistence and robustness of meta-data linked accurately to files;
- develop means by which content and its meta-data are automatically logged as present on networks;
- enable the elimination of lengthy manual input;
- increase the degree of content awareness built into networks to create accountability and transparency;
- develop the analytical capability to extract knowledge and value from the data;
- enact policy across all interventions to ensure the preservation of individual's rights, personal privacy and security; and
- develop, through the Knowledge Transfer Network, mechanisms to promote awareness and adoption of meta-data programmes.

2. Improve interoperability and increasing convergence cross-platform

The goal here is to achieve increased technical and service interoperability between content, products and services, platforms, networks and devices. We anticipate significant benefit beyond the Creative Industries, in particular delivering broader societal value to public service sectors.

The Technology Strategy Board will:

- encourage innovation to aid the expansion of existing products and services to exploit multiplatform capability;
- stimulate the development of new skills and cross-media collaboration to aid the development of brand new product or experience concepts that exploit integrated, pervasive environments;
- ensure business models and transaction (including micro-transaction) systems are available to support commerce;
- encourage the development of interface technologies and standards, where required, to increase interoperability between networks, applications platforms and devices; and
- foster solutions to support the trading of digital assets between content creators and distribution platforms.

3. Promote knowledge sharing and multidisciplinary collaboration

With technology convergence blurring the boundaries between sub-sectors, there are benefits to be gained from transferring know-how between different Creative Industry sub-sectors. There are also opportunities to learn from industries outside of the sector. Existing investments, such as the Creative Industries Knowledge Transfer Network (www.citin.org) funded by the Technology Strategy Board, will have a significant role in encouraging knowledge exchange.

The Technology Strategy Board will:

- provide a trusted source of knowledge on technology and market developments and provide the mechanisms for creative businesses to explore potential impacts and opportunities;
- promote partnerships between business and academia through collaborative projects and Knowledge Transfer Partnerships;
- signpost creative businesses to other support-agencies within the broader innovation landscape and, where needed, develop the mutual understanding necessary to facilitate successful relationships;
- promote multidisciplinary cross-fertilisation between the Creative Industries sector and other technology and market application areas supported by the Technology Strategy Board;
- transfer creative industry know-how to other sectors, in particular to apply design thinking and creative industry solutions to societal and industry challenges; and
- engage UK creative industries with the European Framework Programme.

4. Working with others

The importance of the creative economy and the diversity of the sector is reflected by a range of public sector funded initiatives, from the Arts Council through to regional support programmes. We will maximise the impact of public sector investment on business growth.

The Technology Strategy Board will:

- work closely with business and with public sector stakeholder organisations such as the Research Councils, Regional Development Agencies, Devolved Administrations and other Non Departmental Public Bodies (eg the Film Council and Design Council) to identify complementary opportunities and, where appropriate, develop and implement multi-agency collaborative programmes.

5. Exploit emergent opportunities

The pace of technological change affecting the creative industries is rapid and we have seen emerging capability being successfully exploited to develop significant new businesses within short time periods.

The Technology Strategy Board will:

- identify and evaluate these opportunities;
- encourage business to invest within appropriate timeframes to maximise exploitation potential; and
- consider the development of targeted interventions, outside of the key focus areas outlined above, to stimulate investment in any emerging areas where the UK has a strong platform to succeed.



1. Background and context

Individual Creative Industry companies have benefitted from technology programme investments since its inception in 2004, through participation in collaborative R&D calls in ICT and manufacturing technologies in particular. In this section, we explain the rationale for selecting the Creative Industries as a target sector in its own right and summarise our activity to date.

The Technology Strategy Board identified the Creative Industries as an Application Area in July 2007. The inclusion was because we recognised the important contribution that the sector makes to the UK economy and the role that technology plays in driving the growth of new products and services. Technology Strategy Board interventions in this sector are intended to play a strategic role in stimulating the development of new business ideas and approaches. In many instances these interventions also support the exploitation of investments that Technology Strategy Board has made in related, underpinning technologies such as Information Communication Technologies, Electronics and Materials. See the Technology Strategy Board strategy Connect and Catalyse [2] for further details.

For the purposes of this strategy, our starting point for a definition of the Creative Industries has been the Department of Culture, Media and Sport's 13 sub-sectors. Later in this document, we propose a refinement of that definition which we have adopted to clarify our strategic focus.

1.1 Technology Strategy Board investments

The emphasis on engagement at the outset has been to:

- develop an understanding of the key technology-related market drivers and challenges in the sector;
- drive awareness of the Technology Strategy Board itself; and
- put in place the infrastructure that will enable progress to be made both on the construction of a strategic approach and the mechanisms for delivering it.

Specific interventions to date include:

- **Establishment of the Creative Industries Knowledge Transfer Network (KTN) [8]:** A contract was awarded in May 2008 to a consortium led by the University of the Arts London and including Imperial College London, Royal Institute of British Architects (RIBA) and TIGA, the trade association for games developers. The KTN will form the primary route to market to implement knowledge sharing and exchange activities.
- **£10m Collaborative R&D Call:** Launched January 2008, this programme was designed to be broadly applicable across the sector. The funding was split into three streams with £7m dedicated to larger, collaborative projects focussed on exploiting digital technologies. £3M was allocated to two, technology neutral, six monthly pilots – Feasibility Studies and Fast-track projects designed to encourage application by micro and SME companies. In total, approaching 300 different UK based organisations have benefitted from this programme.

- **Publication of Interim Strategic Assessment:** Serving as an indicator of prevailing thoughts, this document was produced to stimulate discussion and engage sector practitioners in the development of the three-year strategy. The present document represents the outcome of this consultation.
- **£5m Call for Accessing and Commercialising Digital Content in a networked environment:** Opened in March 2009, the aim of this call was to help creative businesses develop technology based solutions to help digital content producers and rights holders realise and maximise the commercial returns from their IP. (Note, this call is now closed.)

2. Industry and market overview

In this section, we review the contribution that the Creative Industries make to the UK economy and our position as a leading player in the global market.

2.1 Overall contribution to the UK economy

The Creative Industries sector [1]:

- contributes 6.4% GVA (excluding crafts and design for whom consistent figures are not available) and has grown by an average of 4% from 1997 to 2006 compared to 3% of the whole of the economy;
- contributes a greater proportion of GDP than any other nation according to a recent OECD study [52];
- accounted for £16 billion of exports in 2006 equating to 4.3% of all goods and services;
- employs an estimated 1.98 million people, equating to 6.78% of the working population. Of these, 1.15 million work within creative companies across 157,400 registered businesses (2008) and the remaining 800,000 work in a creative capacity in other non-“creative industry” sectors.

In recent years, creative employment has been growing at 2%, comparing favourably with a 1% average for the whole economy.

As well as the direct benefits, the richness and intensity of the UK’s creative and cultural sector are believed to be significant factors in attracting companies to locate and invest in the UK. Recent research into the growing percentage of creative workers, in sectors outside of those that covered by the DCMS definition of Creative Industries, also suggests that the sector has a wider impact on the innovation system [3] as a whole.

2.2 Sources of competitive advantage

The UK is recognised globally as a source of original ideas and associated creativity (e.g. script and character development; design of computer games concepts; development and technical production of special effects in film and TV; Artists and Repertoire (A&R) talent-spotting in music, etc). As evidenced by the export figures for royalties and license fees (Figure 4). This success is driven by a number of underlying factors, including:

- until recently, a relatively long period of economic success which has driven strong domestic demand for creative and cultural products;
- historic investment in world class tertiary education in colleges and graduate schools focussed on creative and design disciplines;
- the global uptake of English as the language of business and the internet;
- investment in internationally revered and recognised cultural institutions such as the BBC, British Library, Tate Galleries;

- historic strength of the copyright and intellectual property (IP) regime;
- long history of embracing multiculturalism and diversity;
- the reputation of the UK population as innovators and early adopters of technology;
- provision of a single national, dynamic media market, which enables rapid development of reputation, brands, etc; and
- favourable geographic position and time zone of the UK in facilitating global commerce.

2.3 Comparison to economic performance of other sectors

In comparisons with other leading industry sectors (Table 1), the Creative Industries are an important employer and contributor to the economic wealth of the UK. In addition to the direct contribution, there is the hidden value from embedded creative employment in sectors outside of the creative industry definition, estimated at 800,000 individuals [1].

Table 1 – Comparison of individual economic indicators between the Creative Industries and other leading UK industry sectors; taken from publically available industry and Government sources

	Direct Employment	% GVA
Aerospace ¹	124,000	1.7%#
Pharmaceuticals	72,000 ¹	4 %
Energy	137,800 ²	4.8 ³ %
EPES* & ICT ²	1,820,000	10%
Construction	1,862,000 ¹	8% #
Financial Services ²	1,028,000	7.9%
Manufacturing	3,000,000	12%
Creative Industries ²	1,100,000	6.4%

¹ 2006; ² 2007; Source ONS and Industry Estimates

* Electronics, Photonics and Electrical Systems

GDP

2.4 Comparison economic performance individual sub-sectors

The Creative Industries generated total revenues of £67.5 billion in 2007 [1] (Figures 1 and 2). There is considerable variation in economic contribution between the sectors, with publishing accounting for over 30% of revenue generated by the sector as a whole, but lying behind computer games and film in terms of growth. The sector as whole has enjoyed sustained growth since 2003 (Figure 3) which, prior to the recession, was forecast to continue.

Figure 1 – Estimated revenues by sector (2007)

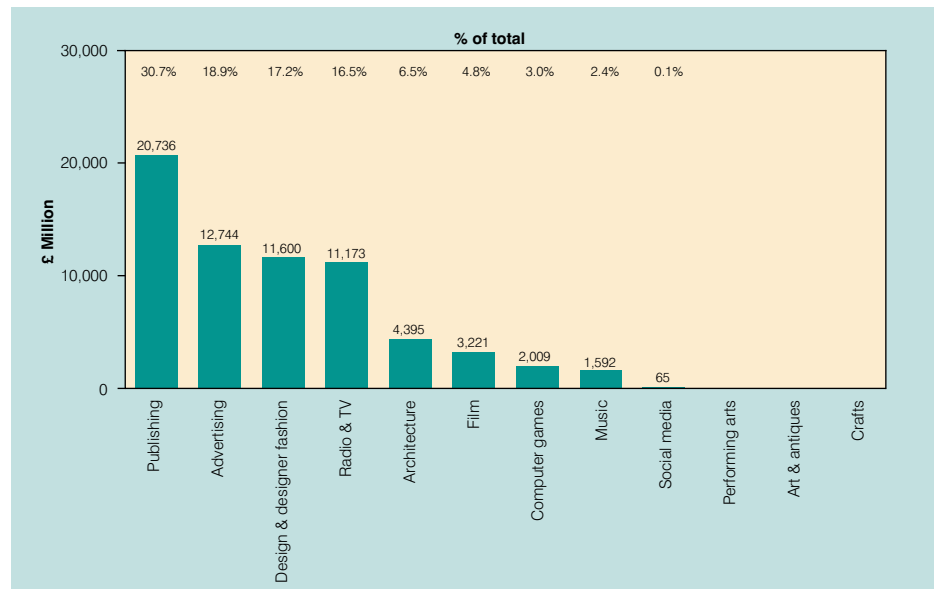
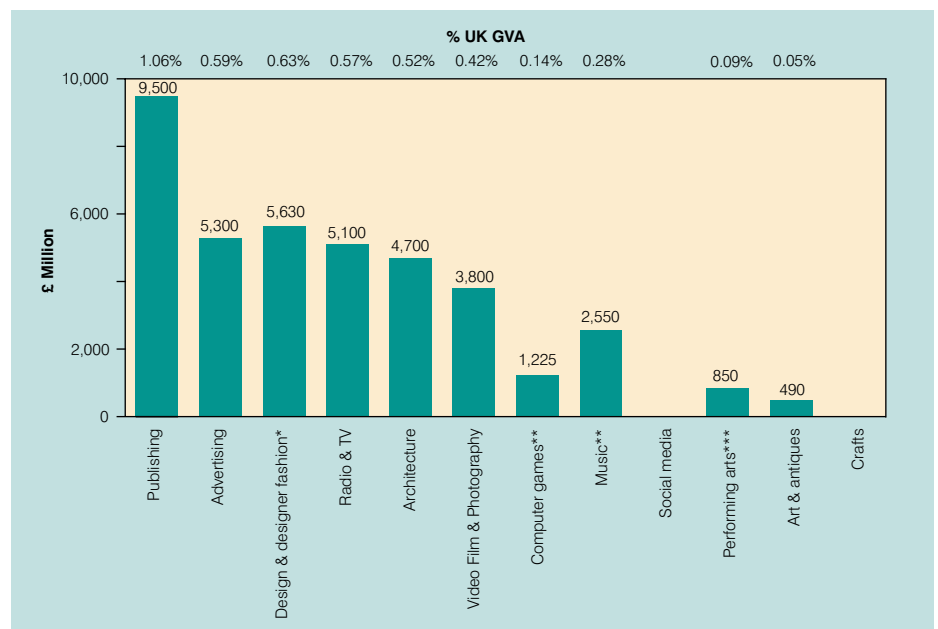


Figure 2 – Estimated GVA by sector (2007)

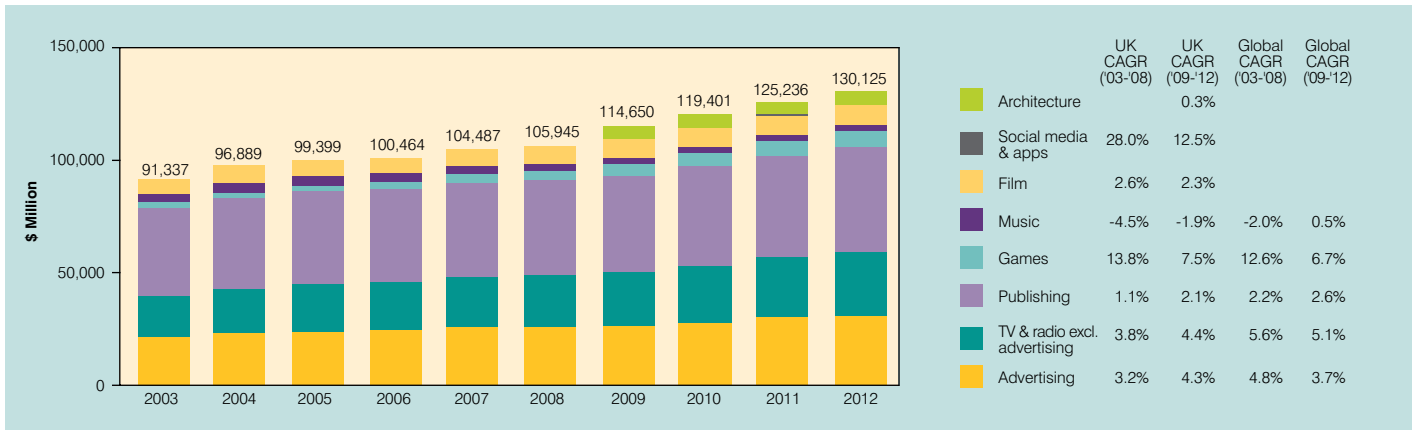


Notes: Due to use of different sources for turnover and GVA – and differing definitions of each sector – the GVA numbers are higher than the revenue numbers in the architecture, film and music sub-sectors. Advertising spend is double-counted in revenue (due to its inclusion in radio and TV and publishing as well as in the advertising category). Excluding ad revenue from radio and TV (~£7.7bn), magazines (£1.6bn) and newspapers (£7.9bn) the total UK revenue is ~£50.5bn. UK GVA based on DCMS 2006 estimate of £895,313m.

- *Design and designer fashion from 2003 DCMS report (last available)
- ** Computer games estimated to account for ~5% of total software, computer games and e-publishing DCMS-reported GVA contribution (based on relative market sizes).
- *** Performing arts and music combined in 2006 report – split out using employee split between the two industries.

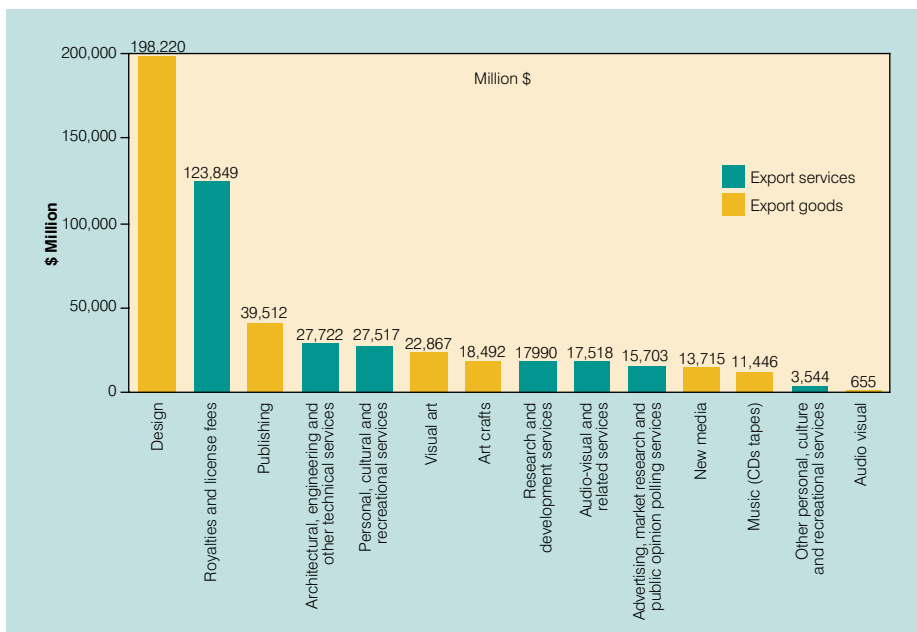
Sources: All revenue estimates from PWC, Global Entertainment & Media Market Outlook, 2008, except social media – eMarketer 2007, advertising – Zenth/Optimedia estimates, architecture – Construction Industry Council, design – DCMS Creative Industries Economic Estimates Statistics Bulletin, Jan '09

Figure 3 – Global historic and forecast growth in the Creative Industries



The chart shows the historical actual and forecast growth in the Creative Industries as projected by PWC, summer 2008. It should be noted that the “music” category here represents recorded music only and does not reflect the consistent growth that has occurred in live music and music publishing. It should also be noted that the impact of the recession on the above chart has yet to be reforecast, but the growth will have slowed in some segments more than in others. Advertising in particular may be less positive than indicated here.

Figure 4 – Global export value of creative goods (2006) and creative services (2005)



Source: UNCTAD, World Creative Economy Report, 2008

Turning to the relative performance of exports, it is notable that royalty and license fees perform particularly strongly reflecting the strength of the UK as a source of ideas. For example, 30 of the top 200 films at the world box office in 2001-2007 were based on stories and characters created by British writers generating £14 billion at the worldwide box office; (e.g. JK Rowling, Tolkien and CS Lewis). In these UNCTAD numbers, the figure for design is inflated because design is included with the manufacture of physical goods. Appendix 1 contains an overview of the each of the sub-sectors.

2.5 Position of the UK Creative Industries in the world economy

Healthy domestic demand for creative goods and services provides the UK with a strong competitive platform in the world market in many of the individual sub-sectors. We have the largest number of games development studios in Europe and are the third [44] largest producer in the world. Figure 5 compares exports of creative services for the top 10 performing countries. Despite data for architecture, advertising and R&D being unavailable for UK, US and France, the UK is positioned third in world rankings. The DCMS 2007 [1] export estimates for advertising and architecture, £1400m and £740m respectively, would position the UK as second only to the US.

In terms of creative goods, the UK ranks sixth in overall worldwide performance, with China leading the field (Figure 6). It should be noted that these figures include the product of the creative services, i.e. the manufacture of the creative good. It may be argued that this accounting does not place sufficient emphasis on the value of the creative endeavour.

Slumdog Millionaire

Slumdog Millionaire took the 2009 Oscars by storm, winning eight awards. Although it was set and shot in India, the film reflects a variety of facets of the UK's talent and creativity and represents a truly global product. The plot is predicated on the aspirational British television program format "Who wants to be a millionaire?" – the most syndicated television format ever, with shows in over 100 countries in the last eleven years. Screen Digest estimates that, in 2004, the global format business was worth \$2.4 billion with the UK the biggest exporter of television formats: 32% of all format hours broadcast worldwide originate in the UK. The young cast, starring Dev Patel, drew from the strength of UK domestic television drama. Patel has appeared in Channel 4's hit series Skins. The success also

highlights the uniquely British talents of the film's director, Danny Boyle, whose previous films include Shallow Grave, Trainspotting, and 28 Days Later.

Production Budget: \$15 million; Total worldwide gross revenue: \$272 million

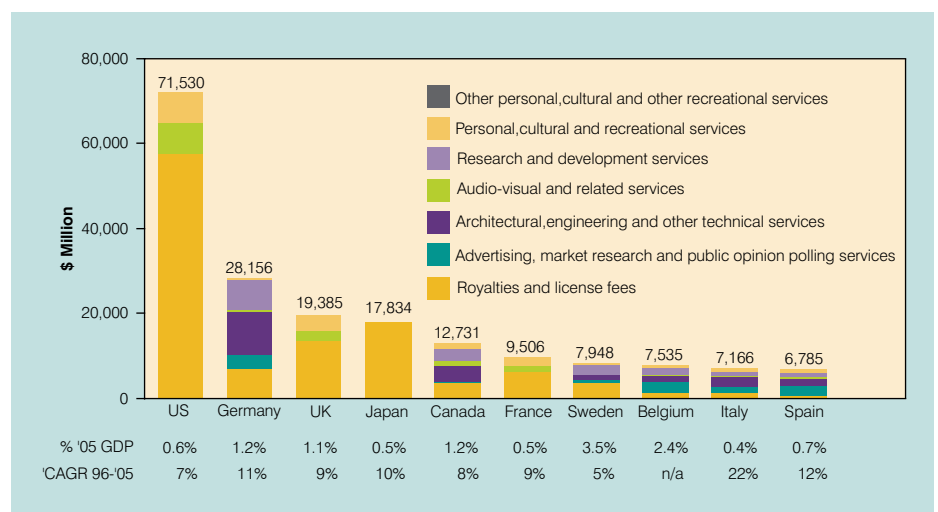
Distributor: Fox Searchlight; Production Companies: Celador Films, Film 4 Productions

Academy Awards

Picture: Christian Colson; Director: Danny Boyle; Adapted Screenplay: Screenplay by Simon Beaufoy

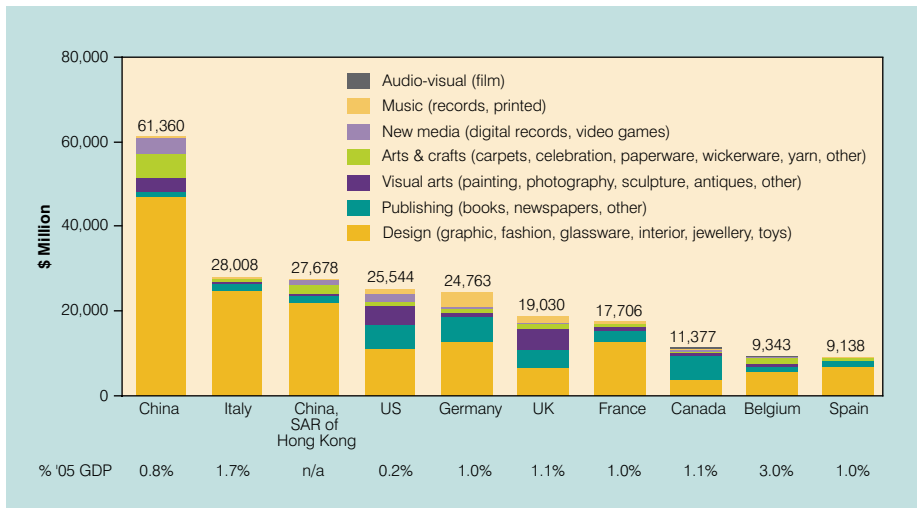
Editing: Chris Dickens; Cinematography: Anthony Dod Mantle; Sound: Ian Tapp, Richard Pryke and Resul Pookutty; Original Score: A.R. Rahman; Original Song: "Jai Ho" – Music by A.R. Rahman; Lyric by Gulzar (Sources: BBC, screendigest, boxofficemojo.com)

Figure 5 – Top 10 performing countries by exported value of creative services (2005)



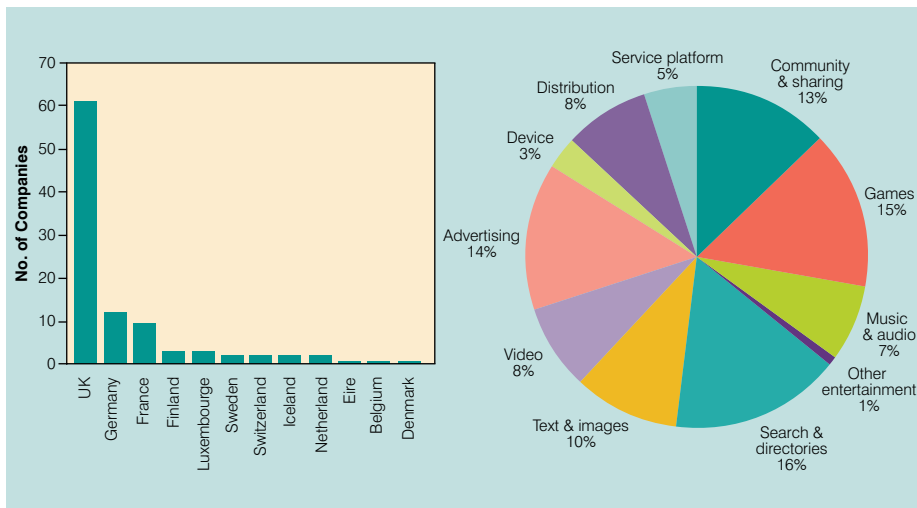
Source: UNCTAD, World Creative Economy Report, 2008; CIA World Factbook, 2005

Figure 6 – Top 10 performing countries by exported value of creative goods (2006)



Source: UNCTAD, World Creative Economy Report, 2008; CIA World Factbook, 2005

Figure 7– Library House 2008 Top 100 European mediatech companies to watch by country & sector



The strength of the UK’s innovation capacity and capability is evidenced by the proportion of private sector investment, by country, in early stage media-tech companies (Figure 7). According to Library House, in 2006, UK companies secured a third of all European Venture investment in

MediaTech. In a subsequent report identifying the top 100 European MediaTech companies to watch, the UK dominated with a 60% share. This highlights UK leadership in exploiting the potential of digital content, with search, games, advertising and social media generating most interest.

Harry Potter – J K Rowling

Cross-Media Success from books, to movies, to games, to merchandise...

Since the publication of Harry Potter and the Philosopher’s Stone in 1997, British author J K Rowling and her UK publishers, Bloomsbury Publishing plc, have benefited from significant growth and profitability from the massive worldwide creative success of the Harry Potter series. Nigel Newton, chairman of Bloomsbury, observed in his 2005 annual report that the series would be seen as “one of the most significant backlists in modern publishing history”. The seven Harry Potter books are now **translated into 67 languages** and, by June 2008, had achieved worldwide sales of the **400 million copies**.

The books have spawned film adaptations produced by Warner Bros. and **eight video games** on almost all the standard console platforms. Harry Potter and the Sorcerer’s Stone (PS1) is estimated by PCvsConsole.com to have grossed \$8 million in the US alone in 2004. By 2005, the **Harry Potter brand was estimated to be worth US\$4 billion**. The franchise licensed more than **400 additional Harry Potter products**. In March 2009, Warner Bros. Consumer Products (WBCP) reported that Panini, a manufacturer of collectible stickers and trading cards, had sold in excess of **1.25 billion Harry Potter stickers** and DeAgostini’s Harry Potter Chess Partwork sold more than 23m copies in just over 2 years.

In 2005, Forbes magazine estimated that on movie revenue, Rowling takes 1% of domestic box-office and 0.5% of international ticket sales. Media by Numbers LLC estimates that the **first four Harry Potter movies alone grossed over \$3.5 billion** by 2007. The 2007 Sunday Times Rich List estimated JK Rowling’s **personal fortune to be £545 million**.

3. Characteristics of the UK Creative Industries sector

The distinct features of the sector that have shaped the structure and behaviour of the industry are discussed in this section. We also explore how digital technologies in particular are driving fundamental changes in business models and the value chain.

The sector is highly fragmented in nature, characterised by a large proportion of small and micro companies. The ability to respond quickly to emerging opportunities contributes to the success and dynamism of the sector. However, in a swiftly changing environment, it can be difficult for smaller or even medium sized companies to keep up to date with technology and market developments, evaluate the impact and develop their businesses to capitalise on opportunities. Across many of the content sectors – for example computer games, music, film, TV and publishing – the route to market is dominated by a small number of large players. In addition, the sector also includes significant public service bodies such as the BBC, Channel 4 and a wide variety of publicly funded arts organisations.

3.1 Sources of value and business models

3.1.1 Content industries

Commercial exploitation through active licensing of intellectual property rights (copyright) is the trading framework that underpins much of the content sector. The subjective value and project-based nature of content products are characteristics that distinguish it from more traditional manufactured products. There is a high degree of uncertainty surrounding which products will achieve market success, so investment decisions can be perceived as high risk. Consequently, film, TV, music and computer games companies in particular will attempt to spread the risk,

by working concurrently on a number of projects on the basis that market success of one will mitigate the costs of the less successful. The historic approach in the television world, for example, has been for production companies to get forward commitment from the broadcaster, distributor or publisher, to secure finance in advance of production, relinquishing rights to future license income in return. In music, recording artists receive advances on signing to record labels that may never be recouped – often leaving the artist permanently in debt to their label. It has been standard practice for a long time for major record companies to charge the artist for making their recordings and then to retain the rights in those recording copyrights.

Runescape

Runescape is a massively multiplayer online role-playing game (MMOG). This free-to-play browser based game currently has 5 million active users and over 1 million paying subscribers, who play in French, German and English. Since its launch in 2001 150 million people have played the game. It holds the Guinness World Record as the largest free-to-play MMOG in the world.

Jagex Ltd, an independent developer and publisher of Computer games, that employs 380 staff in its Cambridge and London offices, produces Runescape. Brothers Paul and Andrew Gower and Constant Tedder founded Jagex in 2001. Starting as a university project, the company developed out of the founders' bedroom into one of the world's largest independent games companies. Reported profits for 2006 were £15m

There are two versions of Runescape, a standard and premium edition.

The Jagex business model is based on a substantial minority of premium players paying for additional quests, skills, houses and social interactions. Premium accounts start at £3.50 per month.

In 2008, the company launched FunOrb.com, a mini games portal aimed at the 'hard casual' gamer. A number of other new titles are in development. All the company's products are distributed and played purely online, allowing the business to remain independent from publishers. The company maintains its leading edge by exploiting its own proprietary graphics compression, game engine and network communication technologies.

In its March 2009 report, Screen Digest notes: "Overall, the outlook for subscription-based MMOGs remains positive over the next five years. By 2013, we expect the subscription market to top \$2 billion in consumer spending and for it to maintain its role as a key business model for monetization alongside micro-transactions."

Different approaches are taken in different sub-sectors to maximise the return on investment. Release of the content, for example in the film business, has historically been tightly managed through a series of windows to maximise return potential, typically starting with theatrical release, moving to subscription TV, DVD, DVD rental, Pay to View TV and finally Free to Air.

The extent to which the ideas originators have been able to retain ownership of the value in their IP, in negotiations with the larger organisations (traditionally the route to market), has long been a source of contention. Clearly, digitisation of content and the Internet are opening up new possibilities and distribution opportunities, challenging the traditional model and potentially levelling the playing field for participants. Within the independent production sector, for example in TV, film and to some extent computer games, the business models have only recently started to allow producers to retain global rights in the content they created. The democratisation of access to distribution is enabling a new range of market strategies. This in turn is shifting more power to the producer and the content originators.

Perhaps partly in response to this rapidly changing environment, in recent years there has been steady consolidation within the industry resulting in the emergence of large media multinationals with broad interests across a number of media sectors, for example Sony (Games, Music and Films); Universal (Music and Films); NewsCorp (Publishing, TV, Film, Interactive Media and Film).

3.1.2 Services and artefacts industries

By contrast with the content industries, the services and artefacts sectors (e.g. architecture, advertising, fashion design, arts and crafts) have traditionally operated on a contract basis (delivering a one-off service against a specific client brief, relinquishing future rights to the IP) or as a designer maker (both designing and producing individual or low volume runs of a single design for sale). Increasingly, designers are exploring new business models that involve retaining ownership of IP to derive income beyond the initial design project e.g. product design companies earning income from royalty on sales.

3.2 Employment

The project-based nature of TV and Film production in particular has driven a flexible resourcing model where companies tend to retain a small core team of full time employees and draft in additional resources to fulfil project commitments (or subcontract specialist expertise for specific tasks). Consequently, there is a relatively high percentage of self-employed workers and freelancers that rely on networks and contacts to secure work. Collaborative working, outsourcing and networking are therefore critically important.

Price competition is driving trends toward outsourcing to low wage economies. This is particularly established in the fashion design sector and, more recently, for routine programming and artwork in computer games.

A significant cadre of creative workers will measure success by values other than economic. For many the drivers can be personal passion, pride, commitment and peer recognition in the same way that academics may be primarily looking for reputational value (through opportunities for publishing research papers). These individuals or organisations can provide a valuable input into collaborative partnerships where the eventual outcome will be translated into economic benefit to be exploited by others.

3.3 Creative Industries sector value chain

Traditionally there were four distinct stages in the Creative Industries supply chain (Figure 8), with production and distribution often undertaken by the same organisation. In some sectors e.g. craft, individual designers or sole contributors might undertake all of the tasks. Unlike many other industries, the first stage requires the greatest skill input and is arguably where the majority of the value is created. In the UK, organisations involved in the creative process are likely to be individuals, small companies or exist in vertically integrated supply chain entities. Further along the supply chain, it is larger companies that tend to undertake production and distribution tasks relying on standardisation and scale to make the business model work.

3.3.1 From supply chain to ecology

In the digital domain, there is a much more dynamic relationship between partners (Figure 9) and this has increased the relative influence of each component. Digital distribution processes are less a matter of straightforward logistics, in perhaps the way that physical distribution is, because of the feedback loop created by the data and connectivity involved. Consumer demand can feed back into content production much more rapidly and more accurately than in the past. The purely linear business model is giving way to a much more inter-woven environment, where cross-fertilisation of stimulus and response, data-driven supply and demand, and speed of communication enable a much more rapid evolution of product development and consumption.

As Charles Leadbetter and James Meadway [4] have emphasised, the Network effect is everything in the current market place. As we strive to stimulate technology innovation in the Creative Industries, the networked/connected nature of what we can achieve will be one of the key catalysts of change.

Figure 8 – The value chain in the analogue world



Figure 9 – New ecology of an interactive content development model



3.4 Key stakeholder landscape in the UK

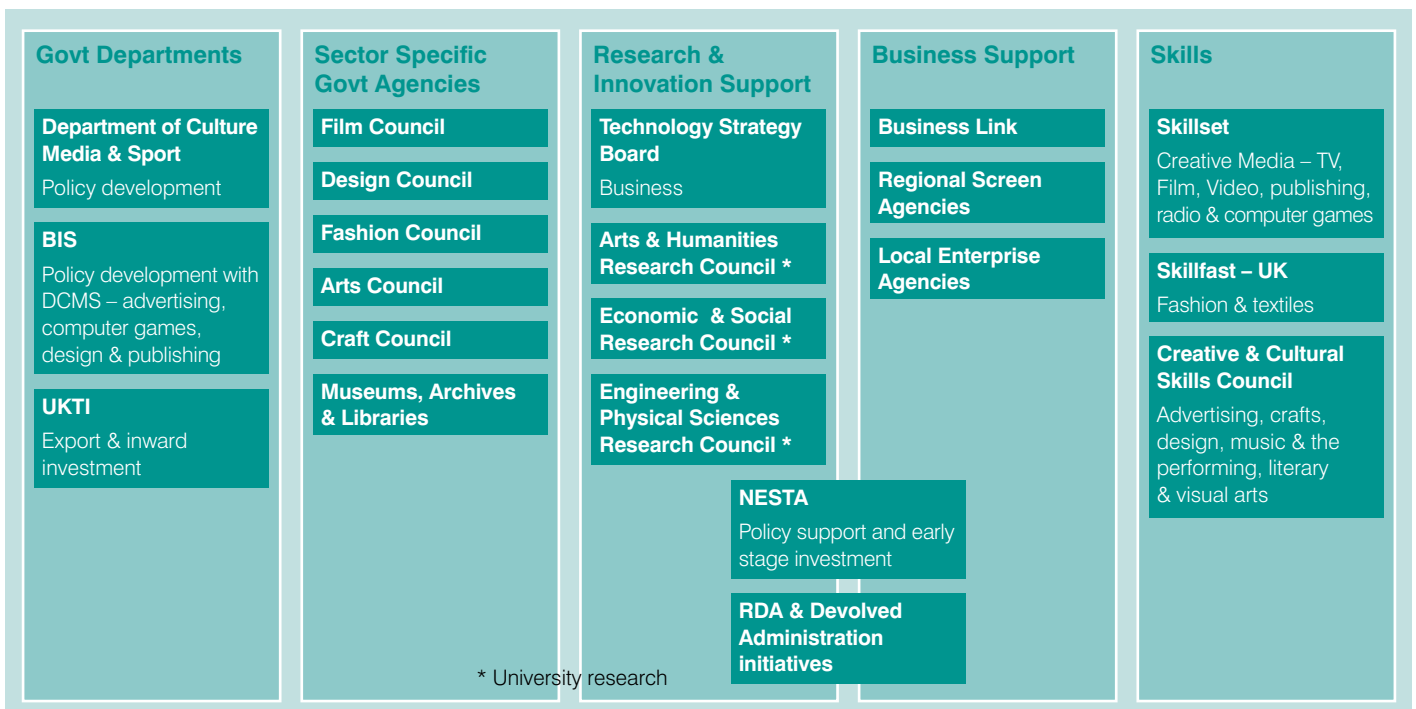
Responsibility for policy across the Creative Industries is split between two Government Departments, with the Department for Business, Innovation and Skills (BIS) sharing responsibility for Advertising, Computer Games, Design and Publishing with the Department for Culture Media and Sport who also takes responsibility for the rest of the sub-sectors that make up the Creative Industries. These departments in turn fund several sector-focused agencies all with different remits. For example, the Arts Council acts primarily as a funding body, whereas the Design Council takes more of a strategic role in promoting design to business and public services to support economic growth of the UK and improve society.

There are a number of agencies with responsibility for the research and

innovation agenda. The research councils have a broad science and research responsibility, whilst the role of the Technology Strategy Board is to stimulate and promote the exploitation of technology and innovation by UK businesses for business and societal benefit. The devolved administrations in Wales, Scotland, Northern Ireland and the English Regional Development Agencies (RDAs) run innovation and business support initiatives focused on regionally specific opportunities, in addition to providing more general business support services. The skills agenda is split between three sector skills councils.

As well as the public sector organisations (Figure 10) there is an extensive web of professional bodies, trade organisations and networks at a national and geographically localised level. This highlights the importance of networking in this sector as a means to secure business.

Figure 10 – Schematic of the UK public sector funded innovation support landscape for the UK Creative Industries sector



4. Sector segmentation approach

In order to effectively identify and prioritise challenges where the Technology Strategy Board could have the greatest impact, we have found it useful to identify those areas of commonality between the thirteen creative industry sub-sectors. Here we explain our approach and the results of that analysis.

The definition of the sector, the “Creative Industries” was coined in the DCMS Creative Mapping Exercise [5] in 1998 and 2000. The sector was taken as comprising thirteen sub-sectors – Advertising, Architecture, Arts and Antique Markets, Crafts, Music, Design, Fashion Design, Film, Computer Games & Software, Performing Arts, TV and Radio, and Publishing. The speed of technological change and market development in the interim has resulted in a blurring of boundaries between some sub-sectors and an increase in the degree of disparity between others.

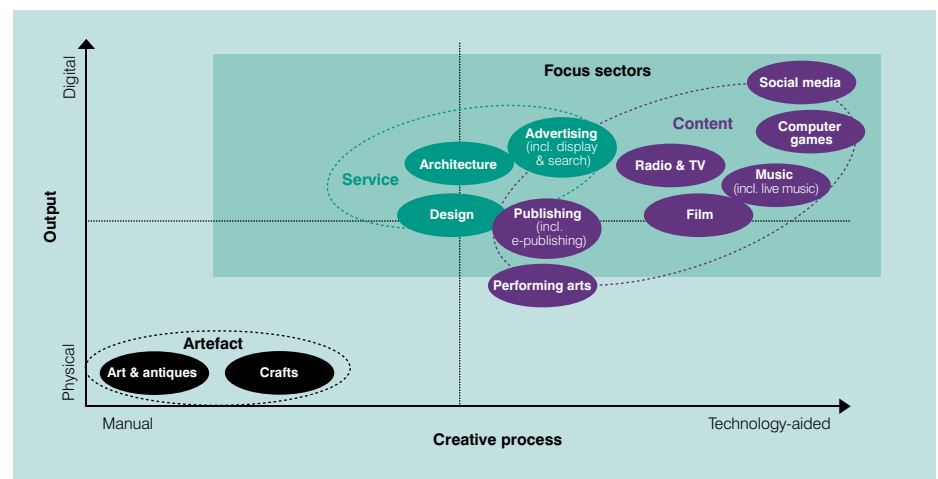
In our analysis of the opportunities within the sector as whole, we have found it helpful to identify areas of commonality and cluster the sub-sectors accordingly. At a basic level, this has involved comparative analysis of two key factors: the relative importance of technology to the creative process itself occurring in the sub-sector and the extent to which the final output is dependant on technology. The result of this analysis has been to re-categorise by output into three main groups:

- **Services** – Advertising, Architecture, and Design (including Fashion Design);
- **Content** – Games, Film, TV, Radio, Publishing, Music, (and Performing Arts: dance, theatre, etc); and
- **Artefacts** – Fine Arts, Crafts.

In addition, we wish to enlarge the Content category by the inclusion a new sub-sector: Social Media. We believe this represents the best way of recognising the enormous upsurge in user-generated and consumer interaction with content. At the same time, we feel it would be helpful to remove the broader category of software development from the Creative Industries sector. With software covered separately by the Technology Strategy Board’s ICT strategy [6] we do not address the specific needs of the software industry in this document, but do include computer games and leisure software. Additionally we have chosen to include Live Music in Music (instead of in the Performing Arts category). We believe this is a more useful reflection of the fact that the live and recorded sectors of music have grown much closer together in the last five years and seem likely to remain so in the digital era.

In comparing the three categories – Services, Content and Artefacts against their respective relationships to technology and relative economic performance (Figures 1 and 2), the economic value increases with degree of digital output and involvement of technology in the business process. Including advertising and excluding software, the content sectors accounted for 70% of Creative Industries GVA in 2006 [1]. It is also clear that, for a variety of reasons already mentioned, the more engaged with digital technology an industry is, the more likely it needs to transform its business model. Figure 11 summarises the results of this analysis.

Figure 11 – Technology Strategy Board approach to Creative Industry sector segmentation



(see Appendix 5 for definition of disciplines that fall under design)

4.1 Adjacent sectors and the broader target audience

In our analysis we recognise that adjacent to the strategic focus sectors are several complementary sectors whose relationship with the Creative Industries is very significant to emergent business models, for example the growing role of mobile phone network operators and handset manufacturers in the marketing and distribution of music and video. New initiatives like Nokia's "Comes with Music" go beyond the simple distribution of music and represent a new model for consumer consumption with implications that flow back into the core industry.

Content offerings now form a key part of these business sectors' value-added strategies. Other examples include network operators, internet service providers (ISPs), cable network companies and consumer electronics manufacturers like Sony Electronics and Apple. The growth of platforms like iTunes or PlayStation is integral to the growth of the digital content industries. It is still possible to make clear distinctions between those businesses closely associated with creative development and production and those who are becoming more involved in distribution. Although distribution activities remain outside of the Creative Industries, they are key enablers of new business models and technologies, and convergence is likely to increase.

The audience for Technology Strategy Board interventions will encompass the value chain and the evolving ecologies of players who are central to the future growth of the sector. These players include, as appropriate, individuals or organisations that:

- originate the creative work;
- commercialise or provide the route to market for the creative work;
- deliver a service based on exploiting the creative work or forms part of its immediate supply chain; and
- provide the specific technology or infrastructure within which creative industry companies operate.

5. Trends and influences

In this section, we look at the wider socio-economic developments that are impacting on the sector. We also discuss the role of technology within creative businesses and explore those technological developments that are exerting most influence and driving change.

5.1 Socio-economic

5.1.1 Changing business models

The growth of the Internet has resulted in a marked shift in advertising spend away from newspaper and TV to the Internet (Figure 12). This has opened up access for smaller businesses, but fragmented the advertising spend of larger brands. An increasingly significant proportion of advertising spend, which was traditionally reinvested by major UK broadcasters into generating new content, is flowing out of the UK to non domiciled ISPs.

Digitisation, increasing bandwidth and broadband internet connectivity have offered unprecedented access to content and services as well as facilitated peer-to-peer (P2P) file sharing on a massive scale. According to the International Federation of the Phonographic Industry [7], illegal P2P file sharing may now be responsible for 95% of all music downloads; motion pictures and television series are available in their entirety on bit-torrent networks. File sharing (and side-loading of content to devices from hard-drives, flash-memory sticks or by Bluetooth locally) has had a dramatic impact on the ability of content producers and distributors to charge for units of content.

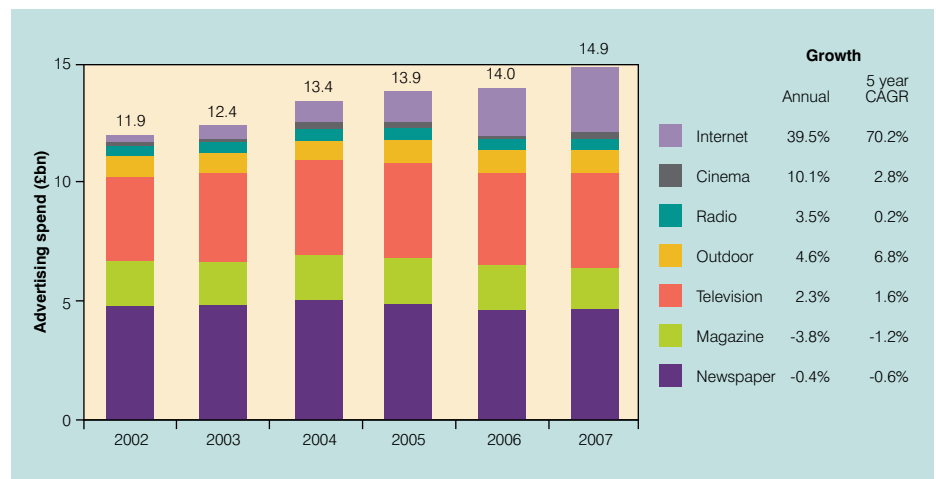
At the same time there is considerable tension between the open source/open business philosophy (where intellectual property is made freely available to be developed or used by others to drive further innovation) and those who continue to advocate locking it down with Digital Rights Management (DRM) technologies that seek to enable rights holders to exercise full control over who has access and how their IP is used. As DRM solutions have proven unworkable or unpopular with consumers, and at best provide speed bumps to slow down the file sharers, businesses are increasingly looking to new ways of monetising their content.

The second half of 2008 saw announcements from the major music

companies and Apple's iTunes (now the biggest retailer of music in the United States [43]) that they were abandoning the practise of offering only copy-protected files for sale by download. This indicates a changing commercial approach. Finding new ways to improve the quality and convenience of service, while exploring other aspects of added value, are increasingly being seen as the way to restore consumer perception of value in content.

The pace of development makes the future difficult to predict, with challenges to business models emerging within a very short timeframe to threaten well established businesses and providing a dynamic marketplace.

Figure 12 – Trends advertising spend, by medium



Source: The Advertising Forecast, Advertising Association statistics published by www.WARC.com. Nielsen Media Research, World Advertising Research Centre

Note: These figures include all advertising spend, including display and classifieds. Internet expenditure includes paid-for search. All figures are nominal. Magazines include consumer and trade.

5.1.2 Emergence of user-generated content and social media

Equally apparent is the changing dynamic between audience and content creator. The influence and immediacy of feedback has grown with consumers increasingly interacting in live TV experiences or providing their own input to content creation. The rise of social networks such as YouTube, Facebook and MySpace has created an entirely new sub-segment in the last five years. Increasingly consumers are interacting with, generating and sharing their own content, much of which activity is also associated with mash-up or re-mix culture. Over this period, non-professionally produced, digital content has been the dominant growth media on the web. In the US User Generated Content (UGC) site visitors are projected to grow from \$69 million in 2006 to \$101 million in 2011, with corresponding growth in ad revenue from \$1 billion in 2007 to \$3.3 billion in 2008 [9].

This rapidly emergent new approach to culture tends toward the irreverent and appears unfettered by traditional concerns about IP clearances and permissions. It frequently involves the adoption and adaptation of other existing digital work, reworking it in a highly creative fashion that undermines older notions of copyright or singular authorship. We have also witnessed the creation of self-narrative content creation in the form of live journals, blogs and Twitter entries. These highly dynamic forms of self-expression, whilst not considered of much monetary value to the creators themselves, frequently represent value to the owners of the platforms that host them.

In Europe, the UK has been quick to embrace social media and is leading the way with 77.9% of the population with access to the Internet using Social Networking sites for an average of 5.8 hours per month, compared to a European average of 56.4% and 3 hours respectively [10]. This phenomenon is helping to further fragment the media market. Although challenging the traditional approaches to advertising, it is opening up opportunities for more effective targeting and enabling brands to develop much deeper, interactive relationship with their consumers.

Social media sites such as Facebook have also opened up their platforms to enable both private individuals and businesses to create widgets that can be distributed to Facebook users and increasingly other social networking sites. They have also developed and implemented structures that support the commercialisation of these applications, the new Apple, Google, Nokia and Blackberry App stores are notable examples.

At a macro level, the sheer volume of information and services available via the Internet makes it increasingly difficult to navigate and to find useful content. This information overload is in turn prompting the development of more intelligent or semantic search technologies.

5.1.3 Personal privacy, security and service quality

There is increasing interest in the aggregated value of meta-data generated by large-scale user activities. The degree to which individual profiling is derived from data-tracking, as well as improved understanding of more generic consumer behaviour, is also raising growing concerns about the protection of personal privacy and the security of the individual's data held online. For this reason it is important to link the Creative Industries community into the activities of the Network Security Innovation Platform sponsored by the Technology Strategy Board.

5.1.4 Digital inclusion

There is also a need to consider digital inclusion and the requirement to improve digital literacy across society more generally, particularly as the Government is increasingly looking to deliver services via the Internet and other digital networks. Otherwise, there is a risk that large sections of the community will be left behind in the digital revolution, unable to access information, entertainment and increasingly important services. The Technology Strategy Board has a role to play in supporting the awareness and development of more intuitive human computer interfaces.

5.2 Technology-driven trends

Technology has an important role as an enabler, spurring the development of new products, services, distribution channels, business models and, on occasions, driving the emergence of significant new sectors. Digital technologies in particular have had a profound effect, from the impact of CAD and desktop publishing software on the design industry in the 80s, through to the recent rise of social networking.

As amply demonstrated in the music industry, the ability of content to be digitised and distributed on line had an immediate and dramatic effect on the business model of the companies creating it. The music industry has spent the last decade trying to come to terms with the implications of digital content online. The traditional routes to market, such as the major record companies, book publishers and broadcasters, no longer control the channels to market in the way that they did. Their business models are being challenged as the internet allows for more direct and richer communication between artist and audience.

5.2.1 Role of technology in the Creative Industries

Technology has three separate relationships to creative industry businesses:

- as a technology enabled product i.e. digital content or applications software;
- as a means of increasing or transforming business processes or business models themselves; and
- as a means of engaging with and strengthening the relationship with the consumer.

Slice the Pie

Slice the Pie has turned the old style record label model on its head by turning the investment and "A&R" decisions over to the music fans themselves.

Artists sign up and upload their profile. They are entered into appropriate Scout Rooms based on genre, location etc. Music Fans are incentivised to listen, rate and review tracks.

The highest rated Artists are showcased, giving fans and serious music financiers the opportunity to invest sums from £1 upwards until they reach the £15,000 target. (If the Artist fails to hit the target after 6 months, they drop out of the Showcase and all investments are refunded.) Artists with established fan bases can bypass the Scout Rooms and raise up to £500,000, with investors receiving exclusive access to the Artist, a free copy of the finished album, their name on the album sleeve and a share

in the financial returns from album and single sales. The Artist receives the money and records the album.

Contracts become tradable on the Slicethepie Exchange, fluctuating in value depending on the anticipated number of album and single sales. Albums are released on iTunes and Amazon, with the Artist paying a £2 royalty on every album sale and 20p per single. The Artist keeps all their copyright and publishing rights and remains free to sign a record deal at any time.

The company launched in the UK with an investment of £1.5 million (\$3 million) on June 18, 2007. In March 2009, they announced a partnership deal with social network operator Bebo, which claims more than 22 million unique visitors worldwide.

To date, the site claims to have raised in excess of £200,000 and financed over 20 artists. Another 30 artists are currently raising finance.

5.2.2 Influential developments

Technology continues to evolve at a consistent rate and its capacity to influence and disrupt the sector does not diminish. Innovators often find their users responding to new technologies in unexpected ways (e.g. the unexpected popularity of SMS text messaging and the recent use of voice synthesis in iPod Shuffles to navigate menus without screens). Below we discuss those developments that are having a broad impact across the sector. Appendix 2 contains an outline summary of the sub-sectors.

Digitisation and network technologies:

As process and content have become more digital, there has been a proliferation of intermediate and consumer digital assets. With the drive to higher audio and video definition, there has been a further increase in data volumes requiring more computing power to process and bandwidth to transmit. The doubling of notional computing power every two years described by Moore's law continues, with the growth in processor performance, storage capacity and sensor resolution, supporting demand for high data rate applications.

The UK has embraced these new technologies – currently ranking fifth in the OECD in penetration of broadband and 11th in households with PCs. Consumers were also quick to respond to ecommerce, becoming the largest online retail market in Europe. The UK is also leading the way in internet advertising, securing an 18.9% share of domestic advertising spend (compared to 13% in US). The demand has stimulated investment in infrastructure [11] e.g. Virgin Media's commitment to offer 50Mbits/s broadband to 70% of its customers by end 2008 and BT's investment to deliver speeds of 40Mbit/s to 40% of all households by 2012.

Visualisation, modelling and simulation:

Visualisation of complex datasets is becoming more commonplace with applications from medical imaging to material structural analysis. Traditional applications, such as mapping, are being transformed by rich media data, from birds-eye views to ground level 3D immersive experiences. The time-consuming practice of constructing physical 3D models is being replaced by virtual representations that can be distributed and accessed more easily. Models can be rendered within virtual worlds, allowing the viewer to see their application in context – contributing to quicker and more effective decision making.

Personalisation, interaction and co-creation:

The reverse process of translating 3D models into solid objects using Rapid Prototyping/ Manufacturing technologies can return virtual models to the physical world. With the integration of design and production tools, the prospect of co-creation or personalised design and manufacture is coming close to reality.

When a user requests a webpage, the content they experience as a single page may in turn be made up of smaller content elements such as news, teasers, embedded movies and advertisements. Those content elements can in turn be subdivided into images, paragraphs, links. Therefore, a single webpage can be considered as an organised hierarchy of information. Other types of content are similarly structured, i.e. as virtual presentations made of simple and compound 3D objects, films of scenes and shots. The borders that delineate these different types of media are blurring. Users are being empowered to modify that structure. Website navigation and layout can be personalised; 3D avatars can be redesigned; films can be mashed up. Databases are being used to store structured content and deliver it in response to implicit and explicit searches. This leads to a situation where no two user experiences are exactly the same

Open source and collaborative platform development:

An open source collaborative approach to product development has been a feature of the success of the Internet (e.g. Wikipedia, Linux and Firefox); 66.7% of web servers run open source Apache over second place Microsoft Internet Information Services (IIS) at 18.7% [48]. Companies have benefitted from leveraging the resources of their consumers, gaining from their commitment, diversity and passion while incurring only a marginal cost to facilitate their activity.

Some projects are made wholly of user contributions while others are seeded by a company releasing, or opening up, its intellectual property to the community. Large technology players such as Amazon, Google and Yahoo have opened up access to their platforms¹ through open Application Programming Interfaces (APIs), that allow programmers to develop entire web services, and have provided corresponding legal framework for their commercialisation. Even information publishers, such as Guardian Media Group and the BBC are providing platform level access to their content to foster new ideas and business models.

With many competing open source programs available, the navigation, selection and implementation of technology has become an expert task, especially when multiple components must work in harmony. Despite this, open source offers a very effective route for low-cost experimentation. For creative companies delivering online services, such as social networks or publishing data, open projects can provide the building blocks with which to discover and innovate. New web-based applications and services can be brought to network quickly, allowing prosumers to decide how to use the technology and even shape its development.

¹ The term platform combines program code, knowledge assets, computing power, storage and network infrastructure.

Interface and sensor technologies:

Embedded sensors such as cameras, GPS chipsets and advances in display technologies in hand-held devices, are enabling applications to contextualise content based on a user's location. They are enabling the consumer to interact with their environment for more immersive experiences, enabling entirely new applications, particularly in the field of Gaming. Alternate Reality Games (ARGs) create fictional interactive narratives that use the real world as a platform. Location-based technology is also enabling advertisers to target consumers based on their location and behaviour as well as their consumer profile. For example, brands can target consumers close to retail environments with specific messages or incentives to encourage purchase of their products.

The number of players in Massively Multiplayer Online Games (MMOGs) has increased dramatically over the last decade as server performance, network capacity and concurrent algorithm design have evolved. Those same drivers are improving the dramatic performance and therefore credibility of non-playing characters (NPCs). Advances in Artificial Intelligence (AI) are progressively bridging the perceptual chasm between real and virtual players, especially in closed-vocabulary interactions such as those found in role-play or strategy games.

Haptic devices, such as Nintendo's Wiimote or Apple's iPhone, are using gestures and device orientation to understand a user's intention, whether hitting a virtual tennis ball or taking a picture in landscape rather than portrait.

Trends towards wearable technology are emerging as computers, sensors, storage and power supplies start appearing embedded within clothing. Such smart materials are already reaching fashion collections, where optical materials (light emitting) and biomimetics (inspired by mimicking nature) are appearing on the catwalk.

Devices: With miniaturisation, devices have become more portable, more powerful and, as price decreases, more pervasive. Where in the past users may have carried several function-specific devices, such as a portable music player, Personal Digital Assistant (PDA) and mobile phone, they are increasingly carrying one single multifunctional device. Running counter to this convergence of outwardly similar gadgets is the divergent creation of newly specialised devices such as eBook readers or hybrids such as Netbooks.

Services such as video conferencing, which ten years ago might have been limited to home or office use, are now available on the move. Mobile phones have sufficiently high frame-rate cameras embedded alongside high resolution displays to capture and playback video, which when coupled with mobile broadband networks (3G), facilitate video calling. This increase in the mobility of applications and services, while technically challenging, creates an opportunity for greater productivity and reduced downtime [49]. Demand is growing for high-performance low-power design, from algorithm to chip, in order to extend battery life.

Distribution: Alternatives to client-server distribution models, such as P2P are gaining traction, although their association with illegal file sharing threatens to undermine the value of what is a highly efficient use of resources. Distributed rendering projects (e.g. SETI@Home), distributed secure file systems (e.g. Tahoe) and control systems (e.g. GIT) all make use of processing power and storage capacity across the network. Increasingly such applications hide from the user the complexity of where and how their data is stored and processed. Cloud computing is extending the concept. Storage and processing resources are virtualised, aggregated with infrastructure, platform and software services and delivered over the Internet.

6. The policy environment

The publication of this technology strategy for the Creative Industries is happening against a background of several significant and far reaching Government initiatives around the creative and digital economy in the UK.

The Technology Strategy Board's research, analysis and industry consultation has taken place in the context of a high level of governmental and other public consultation in the Creative Industries. In November 2005, the Government launched the Creative Economy Programme, recognising the value of the Creative Industries to the UK economy. The Staying Ahead Report (2007) [12] provided a roadmap for many aspects of the Creative Industries. It is the first analysis in recent times to comprehensively identify and clarify the strategic value and economic strength of the UK's creative sector, including its unique influence on the world stage.

Staying Ahead also shows the important linkage to the broader knowledge economy and to the social and economic well-being of the country as a whole. Lord Hutton's key premise throughout has been that "Cultural Industries' – film, television, publishing, music, the performing arts and video games – construct their business models principally upon commercialising acts of origination of expressive value." While that is undoubtedly still the case, the rapid development of social media in the last five years and their increasing economic importance has added significant new paradigms to the model.

1997	Creative industries task force created to increase awareness of the economic importance of the Creative Industries
2001-05	Digital Television Project – joint industry and Government on Digital Switchover
2005	Creative Economy Programme established
2007	Staying Ahead Report [12]
2008	2008 Creative Britain: New Talents for the New Economy published - cross-government strategy for the Creative Industries [13]
2009	Digital Britain Report [14]

Lord Carter's Digital Britain Report [14] highlights the critical importance of technology in the future of the Creative Industries. Closely associated is the UKIPO's 'stakeholder consultation' on Copyright in the 21st century under the direction of Rights Minister, David Lammy.

As well as central government policy initiatives, Channel 4, NESTA and several RDAs and Devolved Administrations have programmes to support the development of innovative applications or businesses that take advantage of the opportunities of new technology and digital networks. Channel 4's 4iP programme is intended "to kick start a wave of new investment in public service digital media for audiences around Britain to deliver publicly valuable content and services on digital media platforms." [50]

The Technology Strategy Board will invest in initiatives to both support and align with the strategic direction of Digital Britain, drawing on priorities within the Electronics, Photonics and Electrical Systems [15], ICT [6], Creative Industries, and the Network Security Innovation Platform [16] strategies, as well as other expertise from within and outside the organisation. In particular the Technology Strategy Board will be responsible for managing a series of test beds to explore cross cutting themes, for example monetisation methods for online content and alternative IP exploitation models.

7. The opportunity landscape

In this section, we draw together our research into the broad external factors affecting the Creative Industries and the outcome of our extensive cross sector consultation, to present a summary of the potential opportunities for investment. We present this overview for completeness, but it would not be feasible for the Technology Strategy Board to address all of these within the strategic period. Our priorities are described in detail in Section 8.

Taking into account socio-economic and technology trends in combination with the strengths and characteristics of the UK Creative Industries, Figure 13 sets out the technology-related landscape of opportunities and challenges for the sector as a whole.

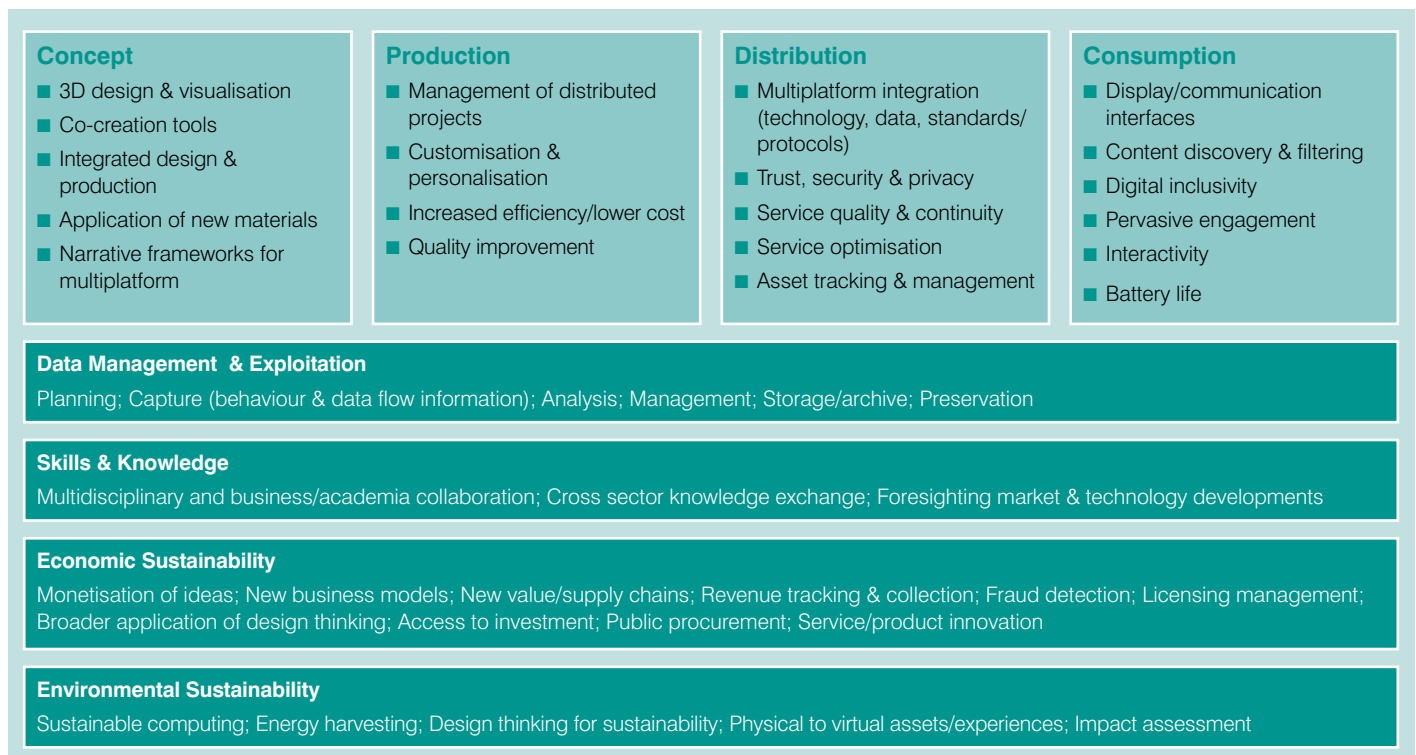
7.1 Conception

The need for new business models to monetise output is currently one of the greatest challenges to the development and support of creative talent in the UK. Although the creative idea does not in itself rely on technology directly, increasingly technology plays a significant

role, whether in helping to communicate a complex idea (e.g. 3D visualisation in architecture) or assisting in the creation of bespoke or co-created consumer products. Features and capabilities offered by a particular technology can be the creative springboard for new services or experiences (3G – and GPS-enabled mobile phones are driving the emergence of location aware and mobile applications).

Technology is also having a democratic impact on content production, enabling consumers to interact with, add interpretation to professionally produced content and create and share their own across digital platforms (e.g. Flickr and YouTube).

Figure 13 – Summary of key technology challenges and opportunities facing the Creative Industries sector as a whole



Visualise

A Technology Strategy Board funded project

Visualise provides an enhanced experience for spectators at large-scale events, through local access to a rich range of media delivered via mobile devices.

Large-scale public media-centric events such as the World Rally Championship, Formula One, the Olympic Games, Test Matches, Glastonbury, and the British Golf Open, typically deploy a huge infrastructure of production and transmission equipment with many fixed and portable cameras. However, most of the content is never made available to local spectators except through a single feed of edited output to portable TVs or large screen displays.



Visualise provides instant, personalised access to video streams and statistical data. Users are able to tap directly into trackside or concert cameras, satellites and background data. This includes non-viewable events or locations, archive material and real-time statistics. For example, spectators at the World Rally Championship would be able to experience all the key events from every stage, they would also be able to follow a team or individual's performance using live timing, live GPS tracking and live video from select locations.

Visualise was a two year collaborative project involving the University of Bristol and a range of industrial partners including, 3C Research, BT, Inmarsat, International Sportsworld Communicators, Maniac Films, ProVision Communication Technologies, Turner Broadcasting, Util4 and U4EA.

7.2 Production

A combination of increasing market competitiveness, product complexity and the project-based nature of much of the sector has resulted in production of digital content particularly in computer games, film (animation, CGI) to be more widely distributed. Whilst this model enables producers to get best value and to access appropriate skills, it places additional challenges in communication, project management, quality assurance and data management.

Technology also has a role in reducing the cost of production and inventory management (e.g. Amazon's print on demand) and in meeting the increasing consumer demand for more personalised products and services. The days of Henry Ford offering you a car in any colour as long as it's black are long gone, with prospective buyers for the Mini Cooper now able to configure the design from hundreds of permutations and combinations.

7.3 Distribution

Technology developments have had a significant impact on the distribution of entertainment and media products, fundamentally changing well-established industry architectures. The opportunities for accessing content services at any time, in any place, on any device and on any platform have still got some way to go. Integration is still needed at a number of levels – technology, service provider, data, content and business model – before the benefits of multiplatform can be fully realised.

7.4 Consumption

Technology is giving the consumer more control over when, where and how content is consumed. New interfaces and display technologies, demonstrated by the huge commercial success of Nintendo Wii, PSP etc and emerging areas in electronic print, such as Sony eBook and Amazon's Kindle, offer scope for further innovation. With the proliferation of information on the web, there are opportunities for more intelligent, context-related content discovery.

As we increasingly conduct business and engage with services over the Internet, the issues surrounding Digital Inclusion become more and more important. As well as supporting development of innovative new services, it is important to ensure that sectors of the population do not become disengaged from the mainstream knowledge economy.

7.5 Data management exploitation

The ability of creative businesses to manage, analyse and interpret data is increasingly becoming critical to success, driven by:

- accelerated transitions from an analogue to a digital world and the associated explosion of content on the Internet;
- challenges of tracking, locating, managing and storing digital assets in networked environments; and
- increases in product complexity and growth in the distributed working/outsourced model of collaborative working.

The importance of globally accepted and implemented information infrastructures, standards and protocols has been long acknowledged and developed by the individual sub-sectors (e.g. ISBN numbers in publishing, XML on the web). In an increasingly converged world, there is a need for more than just a descriptive nature of the asset – for example technical, ownership, rights access information. To be useful, the meta-data associated with any content needs to remain linked with the asset and be able to be interpreted on potentially multiple platforms.

As more consumer services are delivered over networks and companies look to secure competitive advantage through more effective targeting, concern for the protection of individual privacy and security is set to grow. In April 2009, the European Commission announced it is to take legal action against alleged UK contravention of EU data laws on the use of advertising technology Phorm.

7.6 Skills and knowledge

Availability of an appropriately skilled workforce is recognised as a challenge in The Creative Britain and Digital Britain strategies. Although skills are the primary responsibility of other agencies such as the Sector Skills Councils and the Higher Education Funding Council for England, the Technology Strategy Board is well placed to assist through the exploitation of its Knowledge Transfer Networks and Partnerships.

As discussed previously, there is a growing need to provide creative businesses with access to trusted sources of information about emerging technology trends and the opportunity to explore and evaluate the potential implications for their businesses. In an increasingly converged world, where delineations between traditional sub-sectors are blurring, there are potential dividends from importing know-how from other sub-sectors and other industries. Two very different examples demonstrate this: the transfer of understanding about narrative in episodic structures from TV to the computer games sector and the application of process control systems from manufactured goods sector to film production.

We also recognise there are benefits to promoting greater multi-disciplinary collaboration to stimulate transfer of creative industry good practice to other sectors, for example the application of:

- Design thinking in technology driven R&D projects;
- 3D visualisation techniques to interpret and manage complex systems; and
- Computer Games know-how in experiential training and education.

7.7 Economic sustainability

The continued success of the UK Creative Industries sector relies on having robust incentive systems and the infrastructure in

place to reward individuals and organisations within the supply chain. Business processes and commercial models that served well in the analogue world, in many instances have not translated well to the new digitally networked environment. In particular, there is a need to develop new models and mechanisms to support the monetisation of content. Future success also relies on businesses continuing to innovate at both business process level and in developing novel products, services and experiences.

7.8 Environmental sustainability

The Creative Industries, as well as reducing the impact of their own activities on the environment, have a role in supporting the efforts of other industry sectors. For example, sustainable design in construction and, more broadly, the substitution of digital products for physical goods and experiences.

According to the Stern Report published in 2006 [17], ICT activities are responsible for 2% of global CO₂ emissions. The increasing amount and complexity of data used for producing animation films and computer games for example, is increasing the amount of processing power required to render and support production. Therefore, it is important that these industries are engaged with the broader efforts to reduce the carbon footprint of data centres. The application of digital tools to reduce waste and production to demand (such as the print to order service implemented by Amazon) present other opportunities.

We do not intend to focus specifically on environmental sustainability within this strategy but, through investments such as Creative Industries KTN, we will seek to encourage participation by the sector in other low carbon initiatives sponsored the Technology Strategy Board.

8. Strategic priorities

In this section, we assess the opportunities identified in Section 8 against the Technology Strategy Board's four investment criteria:

- **size of the global market opportunity;**
- **capability and capacity of the UK to exploit the outcome;**
- **timeliness;**
- **value add contribution.**

From this, we have identified five priorities for focus and investment over the three-year strategic period.

Throughout our analysis and consultation, we have sought to identify the cross-cutting themes which have the potential to deliver the broadest and most significant impact on economic value and which also represent the greatest opportunity for innovation and industrial activism.

Technology is having the most profound impact on the content sectors, blurring the boundaries between traditional sub-sectors and presenting challenges and opportunities in common. It is by focussing on these common issues that the Technology Strategy Board will be able to maximise impact and economic return on investments and therefore forms the main thrust of the strategy.

At the heart of the challenge is the need to create the conditions, in hardware and software infrastructure and the commercial environment, to ensure that content owners, creators and developers are sufficiently incentivised to continue to innovate. Of equal importance is the need to ensure that UK businesses are well positioned to exploit the significant potential of the converged world. Building strong foundations in these areas will enable the UK content industries to retain their recognised global leadership in

content innovation. In an increasingly digitally networked age, there will be spillover benefits to other industry sectors, not least the creative services and artefacts sectors and more broadly to business and public sector services as a whole.

In seeking to identify where strategic, publicly funded interventions could make the most difference, our analysis has led us to place key emphasis on the following five broad themes:

- 1. Enabling meta-data infrastructure development**
- 2. Improving cross-platform convergence and interoperability, and driving new multi-platform content and services development**
- 3. Developing skills, knowledge exchange and the cross fertilization of know-how between sectors**
- 4. Working with others**
- 5. Provision for emergent opportunities**

8.1 Enabling meta-data² infrastructure development

One of the key issues in the digitally networked world is the inability to prevent the unauthorised digital copying of content by consumers. Speed bumps may slow progress and large-scale pirates may be pursued through the courts, but widespread individual consumer copying is unlikely to diminish. While income from advertising has been seen as a viable alternative revenue source, questions are emerging about whether it is developing at an appropriate pace or has the breadth to represent a comprehensive answer.

² meta-data includes authorship, provenance, rights positions, pricing, ownership, distributor, aggregator and licensee data, production information and identification of how, where, when and the context of content exploitation

If there is market failure here, it is the inability to surface new business models that will make use of the capabilities and characteristics of the digital domain to generate long-term sustainable content businesses.

A key underlying factor is the relative paucity of data about the content moving across networks. The lack of common meta-data formats within or between sub-sectors has slowed licensing efforts and resulted in inefficiency among the many disparate systems in use. Globally, this reduces opportunities for truly unified solutions across digital content regardless of content-type, genre or medium. We believe that technological solutions to unify and make available global meta-data about all content, including commercially available, user generated, public sector and public domain/out of copyright materials, would result in many new opportunities for businesses – some as yet unknown and some more easily foreseeable.

Improved meta-data tracking would assist in simplified rights licensing processing, improve content visibility and the ability to analyse user engagement. Clearly, there is real and valid sensitivity here, regarding the privacy and security of the individual consumer. Part of the requirement for new methods and approaches in this field is the care and attention paid to users permissions or default returns to aggregated solutions in order to maintain long term, high levels of personal security and privacy.

In identifying meta-data infrastructure as a priority, we recognise the global scope of the task and the considerable volume of work that has already been undertaken, with commercial solutions already available in some areas. Our intention is not to encourage more institutions to create meta-data for their content (increasingly this is becoming part of routine production processes), but to increase interoperability between the sectors and extend value by making it richer, for example to include information

about the provenance and production process, as well as the content. The goal is not to try to build a single universal repository of data (as proposed in the Gowers report) but support the standardisation and interoperability of existing databases across the Creative Industries. When combined with network infrastructures that are more capable of supporting meta-data exchange, this could enable significant new ways of driving content discovery, licensing, consumption and new, as yet undetermined, business models.

8.1.1 Creation of meta-data in production processes

Traditionally, information that is linked to content at the point of creation tends to be discarded during the production process, resulting in very little information about the individual components remaining in the final product. These individual components may have separate value aside from the work they were originally generated for. Currently these components are very difficult to identify easily and hence exploit. Employing systems to better capture, store and refine meta-data over the course of content creation, might enable producers and others to generate additional value later. We wish to encourage further exploration into the potential value of technologies that accelerate and automate the process of creating (tagging) and archiving meta-data throughout production.

8.1.2 Stimulating the development of content aware networks

There is great benefit to be derived from encouraging the development of new kinds of content aware infrastructure. This will require the direct involvement of network operators to adapt their networks to become more content aware as they upgrade and invest in next-generation high-speed broadband. We see a smarter content-connected infrastructure as an

important foundation for the value ecosystem and the surrounding architectures of the industries that grow out of them. We anticipate that the shape of both our content industries and bandwidth providers will undergo significant changes in the future and that the Technology Strategy Board will be well placed to support the new businesses and organisations.

8.1.3 Data tracking

The ability to create an identifier (digital fingerprint), which is indivisible from the content itself, enables a digital asset to be tracked as it is distributed and consumed. Some businesses are already using this kind of technology. When used in conjunction with content-aware networks, technologies such as these may help both to protect rights owners and maintain the privacy and trust of their users. With the development of smarter content-aware networks, new tools for analysis and tracking of content usage and user engagement may become increasingly valuable.

Research is still needed to understand better the relative values of aggregated versus individual consumer data, and to ensure utmost respect for privacy and legal requirements. The Technology Strategy Board will support the development of new tools and applications in this area in order to discover new sources of value.

8.1.4 Analytical tool development

Maturing analytic techniques, such as object segmentation, motion and frequency analysis, are key to the semantic interpretation of rich-media content. The application of these techniques in the Internet domain is leading to the creation of the semantic web and new search tools. At the meeting point of these technologies lies the next generation of content search, recommendation and discovery services. Encouraging their development and

exploitation within the Creative Industries may enable users to combine and aggregate content in order to produce new customised experiences. By supporting and promoting their application, the Technology Strategy Board will help to open up potential new revenue streams for content owners and creators.

8.1.5 Alignment with Technology Strategy Board investment criteria

In summary, this is an integrated vision of networks and content working together – not one being the dumb carrier for the other. It is a vision of a next generation network environment designed to facilitate monetisation in numerous new ways, but engineered with the clear understanding that only with networks and content working together will we establish new conditions for further economic growth. It is a broad vision of a content-aware network that does not presume any single business model, but seeks to anticipate which conditions might be required to enable new models to develop beyond the current simple transaction-based or advertising-based methods of charging.

Economic impact: The contribution that content businesses make to the UK economy and in global markets is significant and growing, but is compromised by the challenges of evolving their business models and processes to succeed in the digital domain.

Capacity to exploit: Many of the components required to fulfil the above vision are beginning to be worked on in different countries around the world, but the UK has a unique opportunity to take the lead in this field both because of our size, our technological ingenuity and our consumers' sense of adventure. We have a consumer base that is among the leading early adopter communities worldwide and we have a national media infrastructure compact enough to enable rapid spread and uptake of new ideas and

platforms. This also builds on previous Technology Strategy Board investments (see case studies).

Timeliness: Video-based content, by virtue of the larger file sizes has been broadly protected from wide scale unauthorised digital downloading. However, with bandwidth availability to the home increasing, this is changing fast.

Added value: In stakeholder discussions, it has become clear that no single sub-sector is likely to emerge as leader or be able to provide sufficient investment in this area to benefit the whole sector and yet the global opportunity for the UK to benefit from leading initiatives in this field are significant. This is a complex task requiring engagement with a wide constituency of different stakeholders, from content owners to network wholesalers. The over-arching remit of the Technology Strategy Board positions it well to help initiate and implement this effort.

8.2 Improving cross-platform interoperability and convergence to drive new multiplatform content, product and service development

The migration of content across different media networks and platforms TV, mobile and the web has been underway for some time. It offers opportunities to extend services, grow audience interaction, target different demographics, and develop completely new service and experience formats.

The range of devices and environments in which we consume content is widespread and increasingly portable and ubiquitous. Whether consumers watch high definition, full screen movies at home or play games on phones while travelling, the potential for enriching, deepening and extending those experiences across and

between platforms has a new currency across a very wide range of the arts and media. Current approaches tend to be led by one medium and then extended into other areas, for example a TV show yielding text message interactions and a promotional website.

One particular example of the value of platform interoperability and service ubiquity is in serving as a bridge between live performance and the digital domain, to extend audiences and generate additional revenue. The diversity of publicly funded arts productions taking place around the UK represents a significant content resource that could be captured, digitised and distributed to a wider audience across different platforms. For example, Opera at Covent Garden has been distributed to a wider audience in cinemas, in both live and recorded formats. The Technology Strategy Board anticipates that there will be significant public benefit to be derived from this kind of extension that reaches beyond the Creative Industries to other public service sectors.

The key underlying objective is to achieve increased technical and service interoperability between content, products and services, infrastructure management, platforms, networks and devices. This kind of service level functionality will enable new business models that run across platforms and exploit ubiquity of content, products and services.

	Global Opportunity	UK Capability	Timeliness	Added Value
Meta – Data infrastructure	High	Medium	High	High
Content Aware Networks	High	Medium	High	High
Analytical Tools	High	High	High	High

Enabling meta-data infrastructure development

Technology Strategy Board will support or create programmes to:

- aid the development of shared standards for meta-data that address both the form in which the metadata is provided (syntax) and the vocabulary used to provide the metadata (semantics) in association with all forms of content or media;
- develop durability, persistence and robustness of meta-data linked accurately to files;
- develop means by which content and its meta-data are automatically logged as present on networks;
- enable the elimination of lengthy manual input;
- increase the degree of content awareness built into networks to create accountability and transparency;
- develop the analytical capability to extract knowledge and value from the data;
- enact policy across all interventions to ensure the preservation of individual's rights, personal privacy and security; and
- develop, through the Knowledge Transfer Network, mechanisms to promote awareness and adoption of meta-data programmes.

Vidipedia

A Technology Strategy Board funded project

Vidipedia is a project that allows audio video (AV) based material to be uploaded, categorised, annotated, searched and found through qualitative meta-data over the internet. The unique value of the Vidipedia system is the use of human annotation and categorisation, something that automated computer systems will never be able to achieve fully. Through professional and community based users, the aim is to provide highly accurate meta-data on the content stored within the Vidipedia system.

This facility is primarily aimed at Archives such as such as ITV, Imperial War Museum, and British Film Institute to broadcast a wide variety of content ranging from high demand AV clips to unseen footage that could also be utilised extensively in areas such as retail, education and community based websites. Effectively unlocking the potential of this type of footage will not only help to sustain Archives but could also release valuable knowledge in the users who contribute to the system.

Vidipedia was a two year collaborative project led by Enigma Interactive, with partners including ITV, Codeworks and the Universities of Newcastle and Sunderland.

Prism

A Technology Strategy Board funded project

In a content-rich world, making it easy for viewers to find the content they are interested in is increasingly important. Program title and descriptions provide a very basic method of discovery and are generally only helpful if the viewer is trying to find something

specific. TV Anytime is an open standard meta-data scheme that allows content to be linked, associated and described in many ways, providing the viewer with a more intuitive way of finding content.

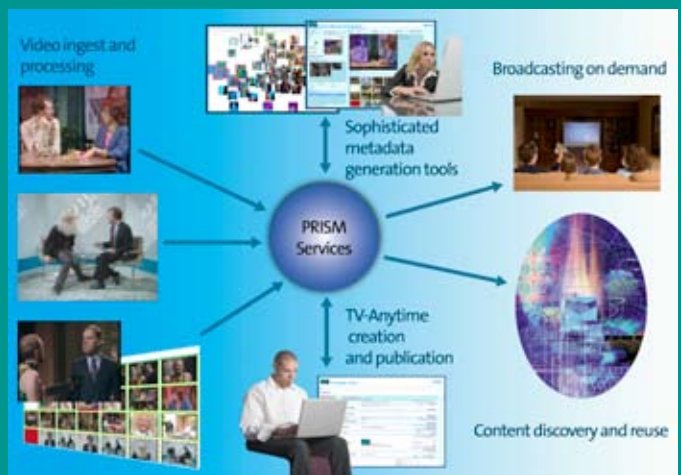
Describing and linking content in such a way requires a lot of effort. It would take several hours to create manually this level of meta-data for only a few programs and any errors or spelling mistakes could prevent the content from associating properly. Automated and semi-automated tools are needed to provide meta-data with sufficient granularity for intuitive search and helping find content they did not necessarily know they were looking for.

For example, a Dr Who episode can belong to a Dr Who series, be classified under several TV genres and be linked to

other content by characters, actors, plot lines and many other themes. It is also possible to link to other media types, such as a Dr Who web page and describe individual scenes within an episode.

The PRISM project employed scene detection and video object recognition tools on a cloud network to create and publish meta-data. This allowed the viewer to search for content-based keywords, shows, series, genres and scene descriptions. The viewer can find more content based on what they have just watched or find new content in many different ways.

PRISM was a three year collaborative project led by The BBC, with partners including BT, GMS, Qinetiq and Queen's University, Belfast.



Dream

A Technology Strategy Board funded project

Moviemaking these days involves more and more data. More material is now shot per movie than ever before. With the digital tools available, more edited versions, involving more colour graded sequences, with more and more combinations of special effects means an ‘explosion’ in data volume. This can make finding the exact combination of take, edit, grade, and effects very difficult. Meta-data is used to ‘track’ the various versions of take, edit, grade, effects etc. However as well as this ‘Image File meta-data’ there are many other forms of meta-data, including image processing meta-data (such as extracted

motion paths of objects that, once deduced, are useful to have for further processes), and Semantic Meta-data, which is particularly useful in identifying and classifying content. Furthermore, some semantic meta-data can be automatically extracted from sequences.

The project outcome is a combination of useable products and tools, including a file system database for data management and access; the use and reuse of complex meta-data for image processing applications and a semantically enabled database. These tools can be combined into an Image library, which can then be used, through complex and semantic meta-data, to represent offline, nearline, and on line assets in ways never possible before. The Semantic database is capable

of ‘learning’ new associations within the images and sequences.

The system as described has been thoroughly evaluated by Double Negative, and measurable performance increases have been seen within defined benchmarked searches. Furthermore, on a recent tour of Hollywood facilities including Warner Brothers, excitement has been seen at the possibilities enabled by the above systems

DREAM was a two year collaborative project led by Filmlight Ltd, manufacturer of systems for the Postproduction industry. The other partners were The Foundry Ltd, a specialist supplier of software tools for postproduction, Double Negative, a major London postproduction house, and the IMSS at the University of Reading.

8.2.1 Alignment with Technology Strategy Board investment criteria

Economic impact: True interoperability offers the potential for development of novel products and services on a global scale and an opportunity to maximise value from digital assets.

Capacity to exploit: The UK has the combination of the creative talents and technical skills (from interface design, through to script writing and technical production) to exploit these opportunities in a more integrated, mutually reinforcing and persistent way. The UK’s relatively sophisticated adoption of mobile and wireless-web platforms presents a significant opportunity to develop more holistic, integrated approaches to content creation and management, and the technically frictionless infrastructure required for content exploitation across all platforms.

Timelines: Consumer appetite is growing, stimulated by market success of first stage of mobile and interactive applications. The commercial configuration of network providers now allows them to offer triple or quadruple play packages, increasing the opportunity for new services

Added value: The Technology Strategy Board through this strategy will provide the stimulus and incentive to act as a catalyst to bring together the content and technology partners necessary to create new content, products and services that exploit an interoperable and pervasive environment.

	Global Opportunity	UK Capability	Timeliness	Added Value
Cross Platform interoperability	High	Medium	High	High
Multiplatform experience	High	High	High	High

Improving cross-platform interoperability and convergence, to drive new multiplatform content, product and service development

The Technology Strategy Board will:

- encourage innovation to aid the expansion of existing products and services to exploit multiplatform capability;
- stimulate the development of new skills and cross-media collaboration to aid the development of brand new product or experience concepts that exploit integrated, pervasive environments;
- ensure business models and transaction (including micro-transaction) systems are available to support commerce;
- encourage the development of interface technologies and standards, where required, to increase interoperability between networks, applications platforms and devices; and
- foster solutions to support the trading of digital assets between content creators and distribution platforms.

8.3 Promoting knowledge exchange and the cross fertilization between sectors

The pace of technology development has both inspired the emergence of significant new sectors, e.g. social media and at the same time challenged well-established business models, over a relatively short timeframe. A rapidly changing environment enables small agile organisations to take advantage of evolving opportunities to develop significant businesses. But established, small and even medium sized, often resource-constrained companies can find it difficult to keep up to date with emerging trends, explore potential impact and develop their business.

With technology there can also be cultural and language barriers which impede knowledge exchange between technologists and creative practitioners. Exploring the technology landscape and its potential impact, and disseminating this knowledge so that it can be easily interpreted and acted on, will be a key activity of the Creative Industries Knowledge Transfer Network.

8.3.1 Promoting collaborative partnerships and knowledge exchange

With technology convergence blurring the boundaries between the individual sub-sectors, there are benefits to transferring know-how between the different sub-sectors (e.g. computer games learning from TV how to develop episode structured games). Similarly, the Creative Industries have much to offer other industry sectors, from applying design thinking in technology based R&D projects to using computer games-based technology in training and education.

Encouraging creative industry businesses to participate in national and European framework programmes (see Appendix 4

for details on alignment of European Framework 7 programme with UK priorities) and facilitating the development of collaborative partnerships will be an important activity for the KTN. The Technology Strategy Board will work with other agencies in the innovation support field to improve realisation of the economic returns from public sector R&D investments.

Promoting skills development, knowledge exchange and multidisciplinary cross fertilisation.

The Technology Strategy Board will:

- provide a trusted source of knowledge on technology and market developments and provide the mechanisms for creative businesses to explore potential impacts and opportunities;
- promote partnerships between business and academia through collaborative projects and Knowledge Transfer Partnerships;
- signpost creative businesses to other support-agencies within the broader innovation landscape and, where needed, develop the mutual understanding necessary to facilitate successful relationships;
- promote multidisciplinary cross-fertilisation between the Creative Industries sector and other technology and market application areas supported by the Technology Strategy Board;
- transfer creative industry know-how to other sectors, in particular to apply design thinking and creative industry solutions to societal and industry challenges; and
- engage UK creative industries with the European Framework Programme.

8.4 Working with others

The importance of the creative economy and the diversity of the sector is reflected by a range of public sector funded initiatives, from the Arts Council through to regional support programmes. We will maximise the impact of public sector investment on business growth.

Working with others

The Technology Strategy Board will:

- work closely with business and with public sector stakeholder organisations such as the Research Councils, Regional Development Agencies, Devolved Administrations and other Non Departmental Public Bodies (eg the Film Council and Design Council) to identify complementary opportunities and, where appropriate, develop and implement multi-agency collaborative programmes.

8.5 Provision for emergent opportunities

The pace of technological change affecting the creative industries is rapid and we have seen emerging capability being successfully exploited to develop significant new businesses within short time periods.

Provision for emergent opportunities

The Technology Strategy Board will:

- identify and evaluate these opportunities;
- encourage business to invest within appropriate timeframes to maximise exploitation potential; and
- consider the development of targeted interventions, outside of the key focus areas outlined above, to stimulate investment in any emerging areas where the UK has a strong platform to succeed.

Appendix 1 – Sub-sector profiles

Advertising

- £5.3 billion (0.6% GVA) contributed to GVA[1], down 23% on the previous year
- 11,000 companies in the sector
- 247,000 staff in creative roles [1], including 153,000 people employed in advertising roles outside the Creative Industries sector.

The UK is the third biggest advertiser [45] in the world after the USA and Japan, with London overwhelmingly chosen as the EMEA hub for the major agency networks and media agencies alike. The total UK advertising market in 2008 stood at £17.5 billion [45], a decrease of £640m on the previous year and expected to fall again in 2009 due to economic factors.

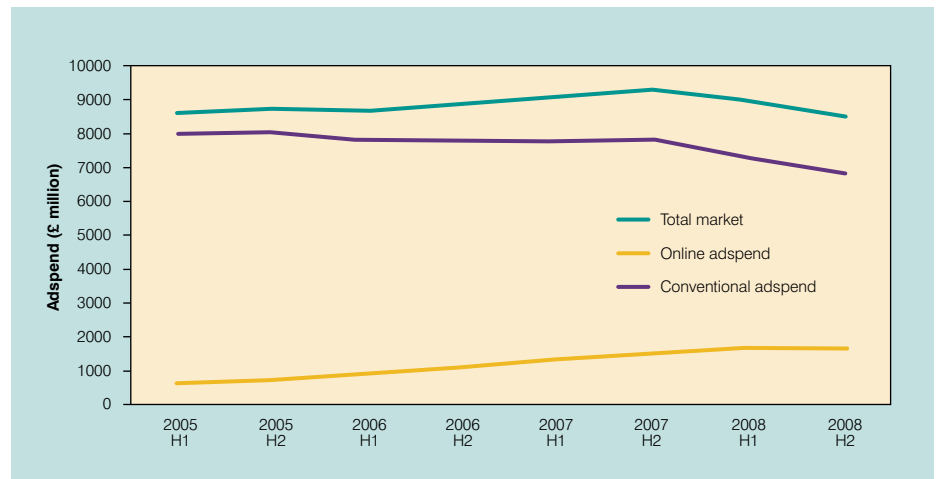
The sub-sector is broadly divided into three supply chain stages: commissioning companies; media and creative agencies; and media buyers. The majority of the media is owned by a small number of large global corporations. Growth is being driven by the Internet, with online adspend reaching £3.3 billion in 2008 [19]. The Advertising industry as whole declined (-3.5%) in the final half of 2008 compared to the same period in 2007, despite a shift towards Internet advertising [19] (Figure 14).

The downturn in TV advertising is already having an effect on the sector. In March 2009, ITV announced a pre-tax loss of £2.7 billion, which Executive Chairman Michael Grade attributed to “the most challenging [conditions in the advertising market] I have experience in over 30 years in UK broadcasting.” The news that WPP, the world’s second biggest advertising agency, is to move to Ireland is expected to cost the UK £204 million in lost tax revenue.

Architecture

- £4.7 billion (0.5%) contributed to GVA [1] in the UK down 2% on previous year
- 5,700 businesses

Figure 14 – Online versus conventional adspend



Source: BPI, Monthly Market Analysis December 2008

- 121,000 staff in creative roles [1], including 31,000 people employed in roles outside the Creative Industries sector.

The Industry is made up of many SMEs, typically comprising three or four chartered architects and support staff, and a few much larger multinational practices such as Aedas Architects, Foster + Partners, BDP, RMJM and Atkins. Similar to the Construction industry at large, fee revenues are concentrated towards the larger players: the top 2% of firms generating 80% of fees [20].

A downturn in that sector has led to an expectation within Architecture of less work in the first half of 2009, particularly amongst small practices [21] and that will have an impact on staffing levels [22]. Public sector commissioning is becoming increasingly important.

Overseas, the US Market is depressed with the Architecture Billings Index hitting a 13-year low of 33.3 [23].

Arts, Crafts and Antiques

The estimated total value of the Craft market in England and Wales has

doubled in the last decade, from £400m in 1994 to £826m in 2004 [41]. The sub-sector employs approximately 110,000 people [1], many in one- or two-person micro-businesses.

The Craft sub-sector is itself made up of many diverse subgroups. Textiles, ceramics, wood, metal and jewellery are the most significant to the UK economy, though glass and furniture are growing in importance. 5.6 million pieces of craft are purchased by people living in England each year, 1.2 million pieces sold in London.

Fine Arts and Antiques contributed £490m to UK GVA, employing 22,900 people in 2005. The sub-sector generated £2.2 billion in 2004. The market comprises contemporary artwork, fine and decorative arts, restoration and resale of cultural property, valuation, cataloguing, exhibitions, auction and retail [12]. In recent years, Young British Artists (YBAs) have enjoyed success on the world stage, iconified by Damien Hirst whose 2008 auction smashed Picasso’s 1993 record.

The UK’s major galleries and museums contribute £1.5 billion to the UK economy,

and attract 42 million visitors [42]. The UK is also home to the annual Frieze Art Fair in London each October, which features 150 of the most exciting contemporary art galleries in the world.

Computer Games

- £1.2 billion (0.1%) contributed to GVA [46], based on a proportionate estimate [1].

At \$2.65 billion (£1.43 billion), the UK is the largest games market in EMEA and the third in the world after the US and Japan, with a 12.4% share of western retail sales [28]. The sub-sector is characterised by a high number of small independent developers and a few large Japanese, US and French-owned publishers, such as Sony Computer Entertainment, Nintendo, Electronic Arts and Ubisoft. In 2007, tax incentives overseas (USA, Canada, France, Switzerland, Germany and Australia) and a skills shortage at home led to the UK slipping from third to fourth largest producer of games by revenue after the USA, Japan and Canada. The huge market success of UK-produced game Grand Theft Auto, is believed to be a significant contributor to the UK regaining third position in 2008.

The sub-sector has a 20-year track record in creating new AAA IP within independent and publisher studios e.g. Grand Theft Auto and Tomb Raider. The year 2006 saw \$730 million [28] (£395 million) invested in development, significantly more than third place Canada at \$420m (£227 million [28]). Work for hire on third party IP dominates most developer's output, capping growth potential and often leading to loss of talent to third parties [28]. Since 2000, there has been a 45% reduction in number of independent developers with 8.5% being acquired.

The UK is under-represented in the growing Massively Multiplayer Online Game (MMOG) market: of the 150

MMOGs currently available in the west, only six were created in the UK and only one has grown to achieve any commercial scale (Jagex's RuneScape). MMOG, Casual and Mobile games companies have captured 56% of the VC games financing in the west since 2000.

Supply does not mirror demand. While the industry is struggling, the market is booming in the UK.

The wide-ranging impact of social media is becoming visible in the Games industry. Sony launched Media Molecule's Little Big Planet in November 2008. While retail sales were initially slow, the BAFTA award-winning game now has 2 million users who have created over 700,000 custom levels. Little Big Planet also demonstrates the broadening access to social media, with levels created by users aged 4 to 60.

Design and Designer Fashion

- £12 billion (1.3%) contributed to GVA, of which £430m from Designer Fashion* [1]
- 116,000 people in creative roles [1].

Design is facing significant competition from China, Western Europe and the US. The UK's design exports form a significantly lower proportion of its exports of creative goods than design goods from the other top 10 exporting countries [25].

Designer fashion, particularly from the well-known labels, is notoriously unprofitable acting as a loss leader in driving the highly profitable business of associated branded cosmetics and fragrances. The UK retail clothing sector is valued at £22 billion [26] of which the UK adult designer market was worth £1.9 billion [27] and grew 2.5% in 2007. The sub-sector is characterised by a large number of small independent, vertically integrated fashion houses. The business is cyclical in nature and orientated around specific buying events, with upfront investment required to develop collections

in advance of sales. With the decline in clothing manufacturing in the UK, fashion firms have moved towards value-add and International sales: 80% of small firms export their products. They make up only 6% of clothing and textile employment, yet account for 14% of the clothing and textile export value.

* Design sector contributed £11.6 billion to GVA in 2005 (2006 figure not available). Number of companies in the Design sector not available due to absence of suitable SIC codes. Similarly, there are differing views when it comes to employment within the sub-sectors with UKTI [24] estimates of 185,000 (2005).

Film

- £3.8 billion contributed to GVA [1], up 27% on previous year
- \$1.5 billion (£747m) spent on production, supported by UK tax relief [29]
- 9,300 businesses
- 65,000 staff employed in creative roles, including 15,000 people employed in roles outside the Creative Industries sector.

In 2007, the UK had the third largest filmed entertainment market globally, after the USA and Japan [29] with key strengths in Special effects and CGI. Typically, a healthy population of freelance specialists serves film production with teams being formed around individual projects.

Dominated by the large US studios, the Film sub-sector is characterised by a high degree of vertical integration with production and distribution residing within the same organisation. Studios are getting involved earlier in the production process, often signing development deals on projects before the scripting stage.

The Film Industry tends to perform well during recessions [30] with the weak pound and tax relief framework making the UK an attractive proposition to foreign production companies. The UK has a strong heritage in IP creation. Thirty of the top 200 films at the world box office in

2001-2007 were based on stories and characters created by British writers (generating £14 billion at the worldwide box office, e.g. JK Rowling and JRR Tolkien).

The UK has a highly successful postproduction industry, predominately based in London (Soho). Of the £1.5 billion (\$2.7 billion) post and facilities global market, the UK captured £319m (\$607m, 22%) in 2008 [47]. For feature films, postproduction accounts for roughly a quarter of a film's production budget. UK Post and Facilities houses are world renown and, in the last twelve months, they have worked on major national and international features: The Boat that Rocked, Harry Potter and the Half-Blood Prince, The Dark Knight and Fast & Furious.

Music (including live music)

- £3.4 billion contributed to GVA [1]
- 28,000 companies
- 260,000 staff in creative roles, including 42,000 people employed in roles outside the Creative Industries sector.

On the world stage, the UK is the fourth largest producer of music for domestic or international consumption, behind US,

Japan and Germany [35]. The industry is divided into recorded, live and publishing, and is dominated by four major labels (Warner Music, EMI, Sony Music and Universal Music), who shared 72% of the world market in 2005 [36].

In 2007, digital sales accounted for 15% of the total music market. Users legally downloaded 1.7 billion tracks, up 53% on the previous year and returned £1.5 billion (\$2.9 billion) to the record companies in revenue [37]. Choice has expanded dramatically online, with users making their selections from over 6 million licensed tracks. Piracy within the industry is rife, with an estimated 34% of young internet users (15-24) file-sharing music illegally.

Sales of physical units have been trending downwards since 2005 [37], whereas digital sales have seen massive, but not proportionate growth (Figure 15). Over 92% of albums were sold in physical units; whereas only 4.2% of singles were sold in the same way. Consequently at the end of 2008, album revenues were down on the previous year (-3.2%), whereas singles sales grew (+33%). Unfortunately, the growth of digital single sales does not offset the loss in physical album sales,

the impact of which is most visible on the High street, as evidenced by the closure of Woolworths in December 2008 and Zavvi calling in the administrators.

While recorded music has experienced a slow down, publishing and live revenues continue to grow, with spending on live reaching £1,279m in 2008 against estimated values for retail of £1,240m [38].

The sector has seen the emergence of a raft of aggregator and intermediary new entrants in the digital arena developing new models for monetisation of music services and products (e.g. Spotify, Last.fm).

Performing Arts

- £4.5 billion contribution to GVA.

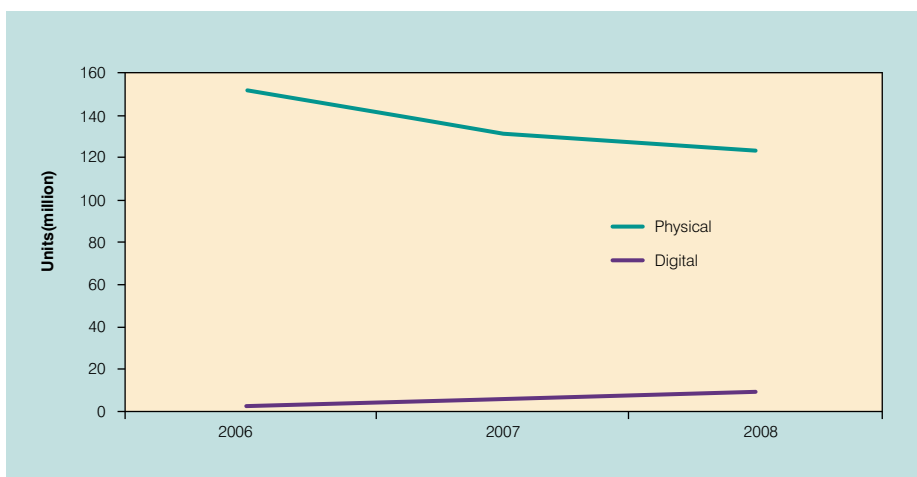
The Performing Arts sub-sector includes Theatre, Opera, Ballet and Dance. Statistics for Performing Arts in isolation are difficult to obtain and where available can be inconsistent.

Creative and Cultural Skills attribute a £4.5 billion UK GVA contribution to Performing Arts, £1.9 billion to Visual Arts and £4.2 billion to the commercial music industry [39].

Many companies in the sector rely on public sector funding, operate on a not-for-profit basis and subscribe to business models similar to those of charities. These organisations are typically small in size and vision driven. They are experiencing skills shortages, particularly in management and business skills.

Attendance of events has remained strong. A survey [40] taken in 2005/06 reported 26% of adults attended a theatre performance, 23% a play or drama, 4% an opera, 4% a ballet and 2% a contemporary dance event.

Figure 15 – Recorded music sales



Source: Internet Advertising Bureau/PricewaterhouseCoopers, Online Adspend – 2008

Publishing

- £9.5 billion contribution to GVA [1] down 3% on previous year
- 6700 companies.

The UK publishing industries generate more than £22 billion in sales annually and £2 billion in export revenues for UK plc. Its contribution to GVA accounts for about 30% of the Creative Industries as a whole. Most staff are employed in the publication of books, magazines, newspapers and their digital analogues.

The key market drivers are public sector purchasing (education), advertising and consumer spending. Both advertising and consumer spending are adversely affected by recession and for which publishing competes with other Creative Industries [32]. The international use of English and the increasing role it plays as a second language represents a great opportunity for the sub-sector.

Whilst academic publishing were early to exploit the benefits of digital distribution, others sectors have been relatively slow adopters of digital technology. Despite a number of false dawns, users have shown a preference for physical reading experiences, but digital content distribution to electronic devices shows the direction of travel. Content is starting to appear for an ever widening set of mobile devices, both bespoke (Kindle, Sony eBook reader) and repurposed (in December 2008, Harper Collins announced a deal to publish the 100 Classic Book Collection for Nintendo DS). The growth of electronic consumption opens Publishing up to the same piracy threat so evident in Film and endemic in Music.

Online publishers are making historic information available on an unprecedented scale. Google have made over half a million public domain books searchable online or downloadable to PCs, mobile phones or eBook readers [33]. Europeana,

a search platform to a collection of European digital libraries, currently contains around 2 million digital items, such as paintings, books and films, and is expected to grow to 10 million by 2010.

Newspapers have been affected by a decline in advertising revenue. The Sun announced a cut in its cover price to 30 pence in August 2008 to bolster circulation, currently at 3 million [34]. In November 2008, the publisher of the Daily Mail reported a 9% drop in profits. Search Engines' rapid aggregation and indexing of news has attracted criticism and put further financial pressure on Newspaper publishers.

TV and Radio

- £5.1 billion contributed to GVA [26], no change on previous year
- 5000 companies
- 103,000 staff in creative roles [1], including 12,000 people employed in roles outside the Creative Industries sector.

TV and Radio is the fourth largest creative sub-sector by revenue in the UK at \$22.4 billion (£11.2 billion) according to figures from 2007 [18], [45]. The world market for UK originated content has been growing, and stood at £2.6 billion in 2004 [31]. The UK sub-sector is unique in the quality and success of its strong public service broadcasters (PSBs) alongside regulated subscription services (e.g. BSkyB, Virgin Media). Sales to UK digital channels, international customers and secondary rights are becoming more significant and now account for in excess of £1 billion.

The evolution of the sub-sector has arguably tended to favour the growth of industry heavyweights or 'super-indies': diversified companies producing multiple genres for almost all of the major broadcasters, and exploiting key rights and brands in the global market – a prime

example being Endemol. It is estimated that in 2004 the top 10 production companies by turnover accounted for close to half of the entire turnover and hours of output of the sub-sector.

Changes within the Advertising sub-sector are affecting many of the Creative Industries, particularly TV. ITV's pre-tax loss for the 2008 financial year and their subsequent cutbacks [51] are a clear indicator of the consequences of TV advertising revenue shifting towards Online. This commercial pressure, coupled with the need to sustain the cultural and social contribution of public service programming, led Lord Carter to examine the role of a second PSB of scale [14].

The BBC launched iPlayer in July 2007 and similar offerings since have been released by ITV, Channel 4 and Sky. The number of iPlayer users rose 27% in April 2008 to 21m, up from 17.2m in March. The growth of this type of application and other high bandwidth services is placing a greater load on broadband infrastructure, which in turn affects network performance for all users.

Appendix 2 – Outline technology trends by sub-sector

Advertising

- Consumer data mining
- Trend towards online, web analytics, quantifiable ROI
- Adwords
- Digital advertising boards (reduction in cost of display technology)
- Use of proximity marketing (Bluetooth and push messaging to mobile, triggered location).

Architecture

- Sustainable design
- CAD and Digital models
- Distributed team working.

Arts, Crafts And Antiques

- Digital artists
- Installation art (wireless, RFID)
- Online sales.

Computer Games

- Moore's law (more immersive environments, higher sample rate surround sound)
- Haptic devices
- Handheld
- MMOG
- Artificial Intelligence
- Non playing characters
- More intelligent games
- Automatic scene generation
- Motion capture and emotion capture
- P2P distribution.

Design and Designer Fashion

- Digital tools for developing and sharing ideas
- New materials
- Wearable electronics
- Functional performance clothing
- Integrated tools
 - Body scanning
 - Laser cutting
- Personalised designer items (Apple engraving).

Film

- End-to-end digital workflow
- Bigger, better, faster
- Evolution of special effects
- Higher resolutions, improved codecs (H.264), HD in same bandwidth
- 4D capture and interpolation, virtual cameras
- 3D stereoscopic capture and projection
- AI for crowd animation
- Motion capture for animation.

Music

- Democratisation of production software
- P2P file sharing, library-based streams, access to online music collection
- Reversing of a trend towards DRM (move back to open MP3).

Performing Arts

- Live streaming of performances
- Digital backdrops
- New materials in set design
- Wireless technologies to control lighting and sound devices.

Publishing

- Hardware: ebooks, kindle
- Media: books repurposed for mobile devices
- Reuse of existing hardware (Nintendo DS)
- Growth in audio books, online news consumption
- Amazon print on demand.

TV & Radio

- Timeshifting and schedule control (Sky Anytime / Virgin on-demand / iPlayer)
- Listen Again / Podcasts
- DAB
- Increased number of channels (Cable/Satellite/Freeview), digital switchover.

Appendix 3 – Alignment with other strategies

The Creative Industries applications area has several points of contact and shared interest with other Technology and Application areas with the Technology Strategy Board. As we focus on the next generation of content-aware networks, the Technology Strategy Board can effectively facilitate the linkage between content owners and network operators (wholesalers and retailers). Similarly, as we pursue the potential in the development and exploitation of meta-data thrown up by the use of content over networks, the work done in the Privacy and Security team will be of great benefit to building a common understanding of what is technically possible, what is commercially valuable and what is permissible from a privacy perspective. Conversely, the bringing of content into network trials represents an opportunity to light up the network more meaningfully than with mere dummy data.

Key Technology or Applications Area or Innovation Platform	Common Interests
Electronics, Photonics and Electrical Systems	Communications and location based services, portable devices, network devices, displays, human factors and machine interfaces, Broadband and fibre to the premises, radio frequency communications including mobile
Information and Communications Technologies	Internet, software, cloud computing, high performance computing (including multicore programming), intelligent systems – human computer interfaces, vision and speech, Web 2.0 and 3.0, human factors
Network Security	Privacy, fraud prevention, inbuilt security, trusted computing
Materials	Smart textiles; sensing and actuating materials; power sources and power harvesting materials; displays; printing; biomimetic; packaging.

Working with these partners from within Technology Strategy Board, the implementation of this strategy will also represent a key contribution to the Digital Britain agenda and work programme going forward. It is our intention that our activities going forward will be aligned with and in support of Digital Britain.

Appendix 4 – Alignment with European Framework 7 Programme

The European Union Seventh Framework Programme (FP7) offers UK creative businesses the opportunity to compete for collaborative Research and Development funding. FP7 is structured into a number of calls, where calls 5 and 6 are yet to close. Within the scope of those pending calls are a number of objectives particularly relevant to the Creative Industries:

ICT-2009.4.1: Digital Libraries and Digital Preservation:

- Scalable systems for preserving digital content
- Intelligent digital curation systems producing adaptive cultural experiences
- Innovative solutions for assembling multimedia digital libraries.

ICT-2009.4.2: Technology-Enabled Learning:

- Future classrooms to facilitate learning in the 21st Century
- Reinforce links between learning and creativity
- Adaptive and intuitive systems for learning including revolutionary learning appliances.

ICT-2009.4.3: Intelligent Information Management

- Capturing tractable information
- Delivering pertinent information
- Collaboration and decision support.

See <http://cordis.europa.eu/fp7/> for more details about how to apply.

Appendix 5 – Design sector definition

Communications design

Graphics, brand, print, information design and corporate identity

Digital and multimedia design

Website, animation, film and television idents, digital design and interaction design

Fashion and textiles design

Fashion and textiles

Interior and exhibition design

Retail design, office planning/workplace design, lighting, display systems, exhibition design

Product and industrial design

Consumer/household products, furniture, industrial design (including automotive design, engineering design, medical products)

Other

Including advertising, aerospace design, building design, engineering design, landscape design, jewellery design, mechanical design etc.

Taken from the Design Council definition at www.designcouncil.org.uk/en/About-Design/Research/The-Business-of-Design2/Definitions-and-methodology.


Appendix 6 – Glossary

AI	Artificial intelligence
ARGs	Alternate reality games
Avatars	Digital/graphical representation of a user
BERR	Department for Business, Enterprise and Regulatory Reform
BIS	Department for Business, Innovation and Skills
CAD	Computer aided design (software design tool)
CGI	Computer generated images
Cloud Computing	Scalable and virtual resources supplied as services over the Internet
DCMS	Department of Culture, Media and Sport
DRM	Digital rights management (both technology and business practice)
European Framework Programme	EU funded research programme to promote cross member collaboration http://cordis.europa.eu/fp7
GIT	A distributed version control system used to help projects manage complex data sets (http://git-scm.com)
GPS	Global positioning system
GVA	Gross value added
KTN	Knowledge Transfer Networks at www.innovateuk.org
KTP	Knowledge Transfer Partnerships at www.innovateuk.org
Mash Ups	Creating new content by blending at least two existing content assets
Meta-data	Data that describes other data assets
Meta materials	Absorb radiation from the electromagnetic spectrum, of which visible light is a part
MMOG	Massively multiplayer online games
NESTA	National Endowment Science Technology & Arts at www.NESTA.org.uk
NCPs	Non playing characters
P2P	Peer to peer
SBRI	Small Business Research Initiative at www.innovateuk.org
Sector Skills Council	At www.sscalliance.org/home/home.asp
Serious Games	Applications using games technology and design for non entertainment purposes
SETI@Home	A scientific experiment that uses redundant computing cycles to analyse radio telescope data (http://setiathome.ssl.berkeley.edu)
Tahoe	A decentralised file system that stores multiple copies of encrypted data across participating machines on the network (http://allmydata.org)
UKIPO	Intellectual Property Office at www.ipo.gov.uk

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