

A Strategy for the Digital Content Industry in Ireland



Functions of Forfás

Is é Forfás an bord náisiúnta um polasaí agus comhairle le haghaidh fiontraíochta, trádála, eolaíochta, teicneolaíochta agus nuála. Is é an comhlacht é a bhfuil comhactaí dlíthiúla an stáit maidir le cur-chun-cinn tionscail agus forbairt teicneolaíochta dílsithe ann. Is é an comhlacht é freisin trína dciomnaítear cumhachtaí ar Fhiontraíocht Éireann le tionscail dúchais a chur chus cinn agus ar ghníomhaireacht Forbartha Tionscail na hÉireann (GFT Éireann) le hinfheistiú isteach sa tír a chur chun tosaigh. Is iad feighmeanna Fhorfáis:

- ▶ *comhairle a chur ar an Aire ó thaobh cúrsaí a bhaineann le forbairt tionscail sa Stát;*
- ▶ *comhairle maidir le forbairt agus comhordú polasaithe a chur ar fáil d'Fhiontraíocht Éireann, d'GFT Éireann agus d'aon fhoras eile dá leithéid (a bunaíodh go reachtúil) a d'fhéadfadh an tAire a ainmniú trí ordú;*
- ▶ *forbairt na tionsclaíochta, na teicneolaíochta, na margaíochta agus acmhainní daonna a spreagadh sa Stát;*
- ▶ *bunú agus forbairt gnóthas tionsclaíoch ón iasacht a spreagadh sa Stát; agus,*
- ▶ *Fiontraíocht Éireann agus GFT Éireann a chomhairliú agus a chomhordú ó thaobh a gcuid feidhmeanna.*

Forfás is the national policy and advisory board for enterprise, trade, science, technology and innovation. It is the body in which the State's legal powers for industrial promotion and technology development have been vested. It is also the body through which powers are delegated to Enterprise Ireland for the promotion of indigenous industry and to IDA Ireland for the promotion of inward investment. The broad functions of Forfás are to:

- ▶ *advise the Minister on matters relating to the development of industry in the State;*
- ▶ *to advise on the development and co-ordination of policy for Enterprise Ireland, IDA Ireland and such other bodies (established by or under statute) as the Minister may by order designate;*
- ▶ *encourage the development of industry, technology, marketing and human resources in the State;*
- ▶ *encourage the establishment and development in the State of industrial undertakings from outside the State; and,*
- ▶ *advise and co-ordinate Enterprise Ireland and IDA Ireland in relation to their functions.*

Foreword by An Tánaiste



The successful development of Ireland's economy, particularly since the mid 1990s has relied significantly on the growth of the higher value-added industries, including those based on world-class R&D and on the creation of Intellectual Property. An example of this – the success of the software industry in Ireland – is a role model we must seek to emulate by identifying and putting in place strategies to address new emerging high potential sectors.

The Digital Content Industry is one such sector. The availability of digital technology is enabling the development of a whole range of new products and services. Accelerating deployment of digital delivery technologies, including internet access and rollout of broadband, will significantly grow market demand for digital content, particularly over the next 5 years. This will provide a range of business opportunities for companies in traditional "content" businesses including entertainment, education and publishing, as well as for companies in mainstream business areas such as financial services and healthcare who have significant information management and distribution requirements. Development of the digital content industry will also generate opportunities for companies providing technologies, software, translation and distribution services to content owners and creators.

The Digital Content Industry, while still at a relatively early stage of development, is emerging as an area of significant global opportunity, valued at over \$172 billion in 2001 and forecast to grow to more than \$434 billion by 2006 – an average annual growth rate of almost 29%. This represents a significant opportunity for Ireland.

Currently the Digital Content Industry in Ireland is small with companies engaged in a range of activities from content creation to the development of related technologies. Ireland however, has significant existing capabilities in related industry sectors including software and localisation. Ireland also has a strong creative tradition and a track-record of partnership between industry and the third level sector in the development of skills and R&D. The challenge is to build on these collective strengths and to identify niche opportunities within the Digital Content Industry where Ireland can aspire to establishing a significant global presence.

I welcome the publication of this report by Forfás which highlights areas of opportunity for Ireland in the Digital Content Industry and identifies actions necessary to ensure that this opportunity can be achieved.

Mary Harney TD
Tánaiste and Minister for Enterprise, Trade & Employment

Foreword



The digital content industry is emerging as an extremely attractive, high-growth, high-value market. Already Ireland has significant competencies in digital content related activities such as content research, skills in e-Learning and the development of enabling technologies. As the industry reaches its high-growth phase over the next three or so years, Ireland has a window of opportunity in which it can build on its existing base in this area and position itself as a global leader in the digital content industry.

Forfás on behalf of the Department of Enterprise, Trade and Employment, and with the development agencies, Enterprise Ireland and IDA Ireland, has completed a review of the industry, both globally and in Ireland, the results of which are summarised in this document. The research confirms that the industry offers significant opportunities for Ireland over the medium-term. It also identifies a number of enterprise and business environment issues that need to be addressed.

Ireland has strengths in the software, e-learning and wireless sectors both in terms of the enterprise base and specialist research activity in the third level sector. Government initiatives such as the Digital Hub and the development of Media Lab Europe, will also contribute to the development of a vibrant digital content industry in Ireland. To become a world leader in the digital content industry Ireland needs to focus on a number of key sectors where our existing strengths can be exploited. These sectors include: digital games, digital libraries, e-Learning, telematics/wireless services, and non-media applications.

However, realising the potential for economic and employment growth will depend on resolving a number of key competitiveness issues. In particular, the levels of R&D activity in enterprises and in the third level sector, the availability of appropriate skills, funding limitations for emerging and developing companies and the availability of required broadband services and infrastructure need to be addressed.

The key challenge is to take the necessary steps to exploit emerging opportunities in the short to medium term, thereby ensuring that Ireland takes advantage of the current "window of opportunity", which exists, in the global digital content industry. Forfás, together with the industrial development agencies, will endeavour to work closely with industry, the third level sector and relevant Government Departments to ensure Ireland realises its potential in the digital content arena.

Martin Cronin
Chief Executive Officer

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Executive Summary

1. Introduction

Digital content is emerging as a new economic sector with tremendous enterprise and creative potential for Ireland.

This new area of economic activity has been brought about through the convergence of previously distinct areas such as traditional content, media and entertainment, software and multimedia, and electronic hardware and telecommunications. Broadly, it encompasses the creation, design, management and distribution of digital products and services and the technologies that underpin them.

Worldwide, the market was estimated at over \$178 billion in 2001 (PwC, 2002). However, the industry is still some distance from maturity, having been adversely impacted by the recent slowdown in the overall Information and Communications Technology (ICT) environment. Previous expectations for the industry may have been overly optimistic and premature. However many developments driving digital content are now only beginning and not anticipated to significantly impact the industry until at least 2005 to 2006, by which time there is expected to be mass market penetration of broadband access and devices. In the intervening period the global digital content market is expected to grow strongly at an annual rate of about 30%, reaching \$434 billion per annum by 2006 (PwC, 2002).

The intervening period between now and the industry reaching a high-growth phase globally in 2005/2006 gives Ireland a critical 'window of opportunity' during which it can carve out a place for itself in new areas of potential strength and expertise and establish a significant presence in a number of high-growth/high-value digital content sectors.

In order for this opportunity to be exploited to the full, the Department of Enterprise, Trade and Employment (DETE) has requested Forfás to develop a co-ordinated strategy for the promotion of the digital content industry. As a first step in that process, Forfás, in conjunction with the Department, Enterprise Ireland and IDA Ireland commissioned PricewaterhouseCoopers (PwC) to undertake a review of the relative stage of development and potential of the digital content industry in Ireland and internationally.

The objective of the review is to pinpoint future opportunities and to identify priority actions to achieve a co-ordinated and strategic approach to the promotion of the digital content industry into the future.

The vision for Ireland as a centre for the digital content industry is:

"to develop a world-class Digital Content industry based on the targeted development of a number of 'clusters' at the 'intellectual property' end of the market, namely enabling technology and high-value content and applications."

This report sets out the important steps that are needed to realise this vision.

2. Opportunities in the Emerging Digital Content Industry for Ireland

The digital content industry is enormously complex and varied, comprising a disparate range of services and products across a broad range of applications, platforms, tools, and industry sectors; embracing education, information, entertainment, and consumer and business-oriented content.

Within this broad area, five market sectors for Ireland have been identified as high potential growth sectors to be jointly targeted by the indigenous and overseas development agencies:

2.1. Games:

The global games market is an area of significant potential. Returns on investment are very high for successful games developers despite the high risk involved in producing games. Quantitatively, the value of the global games industry was estimated at \$50 billion for 2001, and this figure is forecast to grow by over 70% over the next five years to \$86 billion by 2006 (Informa Media, 2001). Ireland's existing strengths lie in the development, design and conversion/packaging of games together with research strengths in both games design and enablers. The enabling technology strengths lie in games middleware. Building on these strengths, there is significant market opportunity for Ireland right across the 'value chain' from games design to games distribution.

2.2. Digital Libraries:

Online content is increasingly being recognised as a source of historical, educational and cultural reference and as such, libraries and other services are beginning to move towards becoming "digital libraries". This niche can be defined broadly as encompassing the software and services associated with the digital asset management of libraries and content located in educational or public establishments. This sector is evolving and represents a high-growth, albeit largely domestic market with opportunities across all public services. To date there has been little enterprise activity in this area in Ireland. However, a range of projects are ongoing in the research and third-level institutes.

2.3. e-Learning:

This sector covers a wide set of applications and processes, including computer-based learning, web-based learning, virtual classrooms, and digital collaboration. Globally, the market is projected to have strong future growth, with e-Learning estimated to exceed \$23 billion by 2003 (IDC, 2001). Ireland's early entry into this market has meant that it has developed a strong international reputation and PwC believes that this can continue to be exploited to ensure the future growth of the sector. Currently, companies are providing full end-to-end solutions, and as such, skills are in place across the entire value chain. In particular they are operating in the high-value technology enabler space primarily in the areas of content creation, web content management, and document management. Into the future, market opportunities for Ireland are projected to emerge right across the value chain.

2.4. Business and Consumer Telematics/Wireless Services:

The use of telematics/wireless communications technologies to access network-based information and applications from mobile devices is still in its infancy. This area has significant potential due to the take-up of mobile devices, primarily mobile phones, but also personal digital assistants (PDAs), and other such systems. Total European mobile content and service revenues are projected to grow from \$5.6 billion in 2002 to \$44.23 billion in 2005 (PwC, 2002). An analysis of the sector shows that Ireland currently has research and market strengths in technological enablers (principally mobile/access devices) and design of digital content together with market strengths in content authoring. By further leveraging Ireland's existing skills, these areas could become high-growth sectors for Ireland.

2.5. **Non-Media Applications:**

Non-media applications typically incorporate high-end imaging, design and virtual reality (VR) technology tools and applications, developed for scientific and industrial use. Aside from entertainment, digital content enabling technologies are aiding the development of a range of industrial and scientific applications across the medical, automotive, aerospace, and petrochemical sectors. This niche is projected to have high-growth globally in both the development of technology enablers and content creation itself (PwC, 2002). It is an area of high potential for Ireland based on the growth of the sector globally and the high-skilled, high value-added nature of the work involved. It is also a key area which could be stimulated through encouragement/sponsorship of Research and Development (R&D) at third level.

3. Recommendations

A number of high-growth sectors in the digital content industry have been identified for Ireland in the previous section. Success in leveraging these opportunities, however, will be dependent on a number of critical factors. These include:

- ▶ *proactive targeted development by the development agencies and government;*
- ▶ *government sponsorship of specific projects/initiatives to act as a catalyst for skills and market development;*
- ▶ *establishment of education and training facilities in areas where there is an identified shortfall of skills going forward;*
- ▶ *continued development of Ireland's telecoms infrastructure and R&D;*
- ▶ *access to finance/funding for digital content enterprise; and,*
- ▶ *the continued support for a "pro-digital content" business environment.*

Specific recommendations to address the issues identified are summarised below.

3.1. Finance and Funding:

In Ireland there is a critical lack of funding to support the development of digital content enterprises. A key reason for this is a dearth of knowledge of the digital content industry and the risks and rewards associated with it. In particular, Ireland lacks digital content-friendly venture capital companies.

The following actions are recommended:

- ▶ *Investigate further if a significant international venture capital company with specialist knowledge and experience in supporting digital content enterprises can be attracted to Ireland (Enterprise Ireland, IDA Ireland).*
- ▶ *Establish a specialist venture capital fund for the digital content industry similar to the fund established for the biotechnology sector in 2002 (Enterprise Ireland, IDA Ireland, DETE).*

3.2. Research and Development:

There are two key research and development supports available for enterprises in Ireland – the Research, Technology & Innovation (RTI) Competitive Grants Initiative and R&D Capability Grants. However, these are not specific to digital content. This has resulted in relatively few content-specific projects receiving R&D funding, and is impacting on the level of digital content R&D conducted in Ireland.

The following actions are recommended:

- ▶ *Introduce a programme to support art and creative colleges to develop R&D specialists in digital content creation and design (Enterprise Ireland, DETE, Irish Council for Science, Technology and Innovation).*
- ▶ *Review the criteria for access to Research, Technology and Innovation (RTI) funding to support content development projects (Enterprise Ireland, IDA Ireland).*

3.3. Legal and Regulatory Environment

There is no specific legislation in Ireland for digital content, with most of the major pieces of legislation applying to e-Business and ICT. Ireland is a forerunner in putting in place a supportive legal and regulatory environment and as such, has some competitive advantage. However, a key area that Ireland needs to strengthen and keep under review relates to intellectual property (IP) protection.

The following actions are recommended:

- ▶ *A marketing/education programme should be developed to encourage registration of IP by digital content SMEs (Enterprise Ireland).*
- ▶ *Increase the statutory protection provided to the Digital Content IP, through the introduction of a law on theft of confidential information (Department of Justice).*

3.4. Fiscal Environment

In comparison to leading digital content economies, Ireland compares reasonably well with regard to fiscal incentives. This is primarily due to the general pro-business tax environment in Ireland rather than to specific fiscal incentives for digital content. There are a number of areas that need to be kept under review, including Ireland's value-added tax (VAT) position vis-à-vis the global marketplace as new European Union (EU) rules may mean that Ireland is not as attractive for non-EU firms supplying digitally to consumers.

The following action is recommended:

- ▶ *Progressively reduce Ireland's VAT rate in line with that of other European countries (Department of Finance, the Revenue Commissioners).*

3.5. Infrastructure

Broadband telecommunications infrastructure is critical for the production and distribution of digital content. Currently, Ireland lags behind its international counterparts in terms of broadband services and infrastructure rollout (Forfás, 2002). This needs to be addressed to ensure Ireland maintains its image as a leading 'wired' ICT economy and to act as a catalyst for the development of the digital content industry. Critically, Ireland needs to develop its international Internet traffic exchange facilities, which are essential for the distribution of digital content from Ireland to the global market.

The following action is recommended:

- ▶ *There is an urgent need for key participants to co-operate in establishing an effective international exchange (Telecom Operators, Independent Service Providers, IDA Ireland).*

3.6. Education and Skills

PwC's research indicates that there are a number of gaps in Ireland's education and training for digital content. This presents barriers to Ireland's ability to realise the potential of the emerging digital content industry. Overcoming these will require a series of policy initiatives by the Government, the industrial development agencies and the industry.

The following actions are recommended:

- ▶ *Complete a detailed audit of the supply and demand for skills in the key areas being targeted for development (Expert Group on Future Skills Needs).*
- ▶ *Promote the introduction of bursaries for students to study in leading international digital content colleges and international competitive placement programmes (Third Level Sector, IDA Ireland, Enterprise Ireland).*

3.7. Enterprise Development

Given that digital content is about the convergence of the creative traditional entertainment and media sectors, with the information, communications and technology sectors, there are a number of Government Departments and agencies involved in the development of the industry. This has not optimised the level of cohesion in the way in which policy can be developed and implemented across the digital content industry.

Another challenge is the lack of awareness among corporate organisations of the benefits of digital content and how it can positively impact their business. If this issue could be addressed, using the Dublin Digital Hub as a showcase for potential, these companies could represent a nascent market for digital content enterprise in Ireland.

The following actions are recommended:

- ▶ *The Department of Enterprise, Trade and Employment supported by Forfás, will establish a digital content steering group, comprising the industrial development agencies and relevant Government Departments to guide and co-ordinate the development of the sectoral strategies for specific niches and to progress implementation of the actions in this report.*
- ▶ *Strategies to establish effective linkages with centres of excellence in digital content internationally should also be developed and pursued.*
- ▶ *The Digital Hub should be developed as a “showcase” for digital content in order to market the capabilities and benefits of digital media/content to the corporate sector in Ireland and internationally (Digital Media Development (DMD), Enterprise Ireland, IDA Ireland).*

3.8. Public Sector Projects

As the digital content market is an emerging one, there is a critical need for the application of market creation interventions in order to drive its development. The establishment of a number of State ‘Digital Library’ projects would offer enormous opportunities to Ireland’s digital content industry. Moreover, some of these initiatives could be undertaken in conjunction with the Digital Hub.

As well as encouraging the development and growth of new digital content products and services, there is also a role for the public sector to help in exploiting more effectively existing Irish digital content and publishing resources such as broadcasting and publishing, including those in State control, as these can serve as a catalyst for the industry’s development in Ireland.

The following actions are recommended:

- ▶ *The public sector should take a leadership role in creating a market for digital content technologies and services in Ireland through the commissioning of ‘digital library’ projects to serve as demonstration projects and to raise awareness of the benefits of digital content (Department of Arts, Sports and Tourism).*
- ▶ *Encourage existing content companies in the broadcasting, media and publishing industries, particularly State-owned companies, to move towards the digital creation, management and distribution of their content (Department of Communications).*

1 Introduction

Digital Content

The digital content industry encompasses the creation, design, management and distribution of digital products and services and the technologies that underpin these activities. It comprises companies from traditional content, media and entertainment, software and multimedia, and electronic hardware and telecommunications sectors. Convergence among these sectors is being led in large part by the rapid growth in information and communications technologies, the Internet and broadband fixed and wireless access and associated devices, which are driving demand for the electronic distribution of content.

The industry is now emerging as an extremely attractive, high-growth, high-value market. Worldwide, its worth was estimated at over \$178 billion in 2001, and this figure is forecasted to grow strongly at an annual rate of 29%, reaching \$434 billion per annum by 2006 (PwC, 2002).

The intervening period between now and the industry reaching that high-growth phase globally in or around 2005 to 2006 gives Ireland a critical 'window of opportunity' during which it can carve out a place for itself in new areas of potential strength and expertise and establish a significant presence in a number of high-growth/high-value digital content sectors.

Current Status of the Industry in Ireland

In Ireland at present, over 280 companies are estimated to be involved in the development of digital products and services, between them employing in the region of 4,000 and 4,500 people (PwC, 2002). These firms are supported by a range of other service and support companies.

The industry primarily comprises indigenous companies, with a total of 238 companies. Similar to international trends, the industry has developed in clusters, namely in the digital film and television, business publishing (including web design) and e-learning areas.

The primary cluster is located in Dublin, where it is estimated that in 2000, 87% of companies were based, the bulk of these being in the south city centre and south coastal areas (PwC, 2002). Other clusters exist in Limerick, primarily in the e-learning area, and in Galway and Cork.

Activity is spread across a range of entertainment, education, consumer and business publishing sectors. In general, companies are fragmented and small in scale, with only limited export markets yet developed. However, skills and competencies vary across the value chain with sectors such as e-learning having a high level and range of competency, while other areas such as digital film and TV are more focused on one aspect of the value chain (content conversion and management).

Strengths

Ireland has a number of important business environment strengths on which a sustainable internationally competitive digital content industry can be developed.

- ▶ *Strong skills have been developed in a number of digital content sectors, and in particular in the e-Learning area.*
- ▶ *The country's robust software sector, with a high concentration of skills provides a strong, healthy basis on which to build the digital content industry.*
- ▶ *The Irish government is ahead of many other economies in terms of recognising the importance of knowledge-based industry and digital content. To date, there have been two key developments of specific relevance to this area: the establishment of the Digital Hub and the development of Media Lab Europe in Ireland.*

➤ *Added to these strengths, Ireland's educated workforce and positive fiscal environment also serve to support the development of the digital content industry.*

The Irish environment for digital content also has its weaknesses, however.

Weaknesses

- *Ireland's traditional media sector is not well developed in the adoption and use of digital technologies and to date, has not significantly acted as a catalyst for digital content industry growth.*
- *The availability and costs of broadband services in Ireland lag those in leading competitor countries.*
- *Digital content R&D levels are low in Ireland.*
- *The lack of a strong industry trade organisation/lobby group in the digital content industry has resulted in limited industry involvement in the development of Government policy.*
- *Although Ireland has an excellent base of software skills, there are critical skills gaps in the areas of creativity, high-end content specific skills and digital content related business skills.*
- *Early stage and start-up capital for digital content companies in Ireland can be difficult to obtain, mainly due to investor withdrawal from ICT related investments and a lack of knowledge of the digital content industry by Irish venture capitalists.*
- *There is a perception among the industry that the range of Government Departments dealing with the digital content industry has led to a lack of cohesion and, in turn, limited the development and implementation of an overall strategy for the industry.*

Existing Initiatives

A number of government and agency initiatives are currently planned and underway to promote digital content industries in Ireland. These include the development of the Digital Media Hub and MIT Media Lab in the Guinness Hop Stores and the promotional activities of Enterprise Ireland and IDA Ireland to develop a number of sectors.

Need for a 'Vision' and Strategy

The development agencies have recognised the need to devise a shared vision and a co-ordinated development strategy for key niche sectors and the requirement to put in place a supportive business environment to allow Ireland to develop as a leading content location over the period to 2006 and beyond.

As such, the agreed vision proposed for Ireland's Digital Content industry is:

➤ *"To develop a world-class Digital Content industry based on the targeted development of a number of "clusters" at the "intellectual property" end of the market, namely enabling technology and high-value content and applications."*

As a first step in realising this vision, the Department of Enterprise, Trade and Employment have requested Forfás to devise an overall strategy for the industry's development.

As part of this process, Forfás commissioned PricewaterhouseCoopers to undertake a review of the digital content industry nationally and internationally. The study was overseen by a steering group chaired by Forfás and comprising representatives from the Industrial Development Agencies, the Department of Enterprise, Trade and Employment, the Department of Communications, Marine and Natural Resources, and the Office of the Director of Telecommunications Regulation.

The objectives of the study are to:

Research Objectives

- ▶ *Profile the global digital content industry;*
- ▶ *Profile leading countries in the global digital content market;*
- ▶ *Identify key policy and technology drivers, and 'best practice' environments that support these countries' leading positions;*
- ▶ *Profile the digital content industry in Ireland (both indigenous and foreign-owned);*
- ▶ *Identify a long-term development vision for Ireland's digital content industry, and the key policy development initiatives required to achieve this vision.*

Process and Methodology

In order to achieve these objectives, the research methodology adopted for the study incorporated a range of quantitative and qualitative elements.

For each of the five research objectives, PwC undertook a series of face-to-face and telephone interviews with digital content companies, industry experts, and policy-making bodies, both here in Ireland and in four leading countries in this area examined as part of the study (the UK, Canada, US, and France). PwC also examined the technologies impacting on the digital content industry, undertaking research in conjunction with its Technology R&D Centre in Menlo Park, California.

The identification of policy recommendations for the industry in Ireland was based on an examination of digital content policies implemented in the four countries examined and, an evaluation of the strengths and weaknesses of the Irish digital content industry, including an assessment of the challenges in the business environment that supports indigenous digital content development and inward investment.

In addition to this process, a workshop was held with digital content industry representatives and policy-makers to: review the environment for digital content in Ireland; identify the necessary factors for the development of a sustainable Irish industry; and to assess the current impediments/challenges to growth of the industry in Ireland and potential policy recommendations. Approximately 30 organisations attended this workshop.

2 Opportunities in the Emerging Digital Content Industry for Ireland

Identifying the Opportunities

The digital content industry is enormously complex and varied, comprising a disparate range of services and products across a broad range of applications, platforms, tools, and industry sectors; embracing education, information, entertainment, and consumer and business-oriented content.

One of the first steps in this process was the development of the digital content value chain to use as a basis upon which to identify the 'high', 'medium' and 'low' growth opportunities within the global digital content industry into the future.

The framework was designed to capture the complexity inherent in the industry, while at the same time providing a clear structure for analysis, in order to identify opportunities along both the digital content value chain (see Figure 1) and the digital market sectors (see Figure 2).

Figure 1. Digital Content Industry Value Chain



The review involved an evaluation of the key technology trends and standards likely to emerge in the future that would impact along the digital content value chain. An in-depth evaluation of the digital content industry in Ireland was undertaken which looked at the market, capabilities, and expertise in Ireland, and mapped these against the global digital content market analysis. A range of digital content opportunities were identified and prioritised for Ireland. The sectors reviewed are set out in Figure 2.

Figure 2. Digital Content Market Sectors

Entertainment	Education	Business/Professional related content
CG animation and SFX	Digital Libraries	Corporate communications
Games	e-Learning	Business publishing
eMusic	Consumer Information	Telematic/wireless services
Digital Film	Online publishing	Non-media applications (design etc.)
Digital TV	Digital publishing	Advertising
Interactive TV	Telematic/wireless services	
Digital Radio		

From this analysis, five areas of high-growth potential and particular attractiveness for Ireland were identified: e-learning, non-media applications, digital libraries, wireless applications, and games. The specific opportunities in each of these areas are profiled in greater detail below.

2.1. Games

The Sector

Globally, the market is seen as an area of high-growth and opportunity across the entire value chain. Returns on investment are very high for successful games developers despite the high risk involved in producing games, due to high failure rates. Moreover, the sector has emerged over the last few years as being largely recession proof, with sales continuing to rise while those in the remainder of the entertainment industry declined.

Quantitatively, the value of the global games industry was estimated at \$50 billion for 2001, and this figure is forecast to grow by over 70% over the next five years to \$86 billion by 2006 (Informa Media, 2001).

In specific terms, the games sector comprises software and hardware platforms for the games industry. These include traditional PC-based platforms (CD-Rom for example), online and hybrid games, handheld devices such as "Gameboy", consoles (including networked/ Internet-enabled consoles), mobile devices (such as mobile phones and wireless devices), and online games accessed through interactive television services and a set-top box.

International Status

Three-dimensional (3D) graphics, photo-realistic animation, cinematic-quality sound and interactive real-time multiplayer games, have recently become a reality for the evolving games industry, driven by the evolution of gaming middleware and 3D. The technology coming out of the games industry is leading academia and other industries in terms of these types of applications.

Games industry development is also being driven by the emergence of new platforms such as wireless and interactive TV (iTV), with the online market audience beginning to grow as broadband and iTV rollout takes place. These have opened up new markets for developers and publishers, in addition to generating a demand for new types of games tailored to the individual platforms.

The arrival of online, wireless and iTV games offers developers, and in particular start-ups/early stage companies a new target market, aside from the highly competitive, high investment console market. Revenues from games offered via the Internet, iTV and mobile phones accounted for less than 2% of the industry total in 2000, but this proportion is projected to rise dramatically to 27% by 2006 (Informa Media, 2001). These games generally fall into a number of categories such as advertising/marketing tools for creating stickiness on websites, or relatively simplistic games.

Wireless and iTV games are less complex with correspondingly less upfront development time and investment required. This opens up opportunities for small or early-stage developers. In addition the industry is moving towards a subscription-based model for online games, which should provide a more robust revenue model.

There is also the emergence of online console devices, requiring high-end online games. Microsoft is rolling out Xbox and Xbox Live, with the company committing an additional US\$2 billion to develop these initiatives up to 2007 (PwC, 2002). In addition, Sony has announced a network adapter for the Playstation2 and by the end of 2002, expects to have sold half a million units in the US. Online games is, however, only expected to be meaningful when broadband penetration evolves, but if it succeeds, it is likely to potentially change the economics of the industry, with subscription based services for example.

The most successful indigenous companies operate in the enabling technology segments producing games middleware (i.e. software that mediates between a games application programme and a network). The remainder of indigenous companies are small start-up operations, and the focus is on a mixture of PC, online and wireless games.

Ireland

Ireland's existing strengths lie in the development, design and conversion/packaging of games together with research strengths in both games design and enablers¹. The enabling technology strengths lie in games middleware. Building on these strengths, there is significant market opportunity for Ireland right across the 'value chain' from games design to games distribution.

Specifically, the games sector offers Ireland 'medium' and 'high' growth potential opportunities. Medium opportunities exist in the technology enabler and content publishing, marketing and distribution areas. High opportunities exist in the content design through to content storage aspects of the value chain.

The potential in the games sector is that small development companies can be highly successful, with the majority of games development houses worldwide tending to be relatively small. In addition, by its nature, the products of the service are internationally tradable and jobs are high skilled.

PwC conclude that Ireland has the potential to build a strong indigenous games industry. Ireland could also be attractive for the development of a strong overseas base of companies, in both games development and publishing and also for distribution and hosting.

A key issue to be addressed is the very limited number of training and education courses currently available for the games sector in Ireland.

2.2. Digital Libraries

The Sector

Online content is increasingly being recognised as a source of historical, educational and cultural reference and as such, libraries and other services are beginning to move towards becoming "digital libraries". This sector can be defined broadly as encompassing the software and services associated with the digital asset management² of libraries and content located in educational or public establishments. This sector is evolving and represents a high-growth, albeit largely domestic market with opportunities across all public services.

International Status

Internationally, work is typically being undertaken through public and private sector partnerships, with key examples being the digitising of the British Library, which is co-ordinating a pan-European project to allow online users access to digital and other collections from institutions across the continent. A 30-month (beginning in 2001) project involving eight libraries from Europe is underway, with the objective of creating a virtual library that can be accessed worldwide.

¹ Enablers are core technologies that are developed to enable the production, management and distribution of digital content.

² This uses a database management system to control functions such as content importing, previewing, editing, and searching.

Ireland

To date there has been little “enterprise” development in Ireland in this area. However, a range of related projects are taking place at third level institutions in Ireland, assisting the development of skills in this area. One example is a project undertaken by the Dublin Institute of Technology (DIT) with the National Gallery of Ireland, to develop a virtual reality based system (Interactive 3D (i3G) gallery) for viewing the gallery’s art collection.

The digital library niche is an area in which PwC believes Irish enterprise could potentially develop a strong capability, with ‘high’ growth opportunities in content design through to content storage (including design, authoring³, packaging and management) and ‘medium’ opportunities for technology enablers.

As already noted, projects are generally commissioned by governments, museums or universities, which have vast archives to be digitised. If the Irish Government was to commission a number of projects in this area to be undertaken in Ireland, this could help to develop skill and expertise in Ireland. In particular, this could proactively refocus Ireland’s strength in online publishing, e-learning and business publishing (web design) to this area. Capabilities in these areas can be readily transferred to digital libraries, which utilise similar skills for creation, management and publishing of data. Opportunities also exist for Irish companies to tender for EU content projects and to partner with companies from other EU countries so as to gain access to required skills and expertise.

2.3. e-Learning

The Sector

The global e-learning market is projected to have strong future growth, reaching over \$23 billion by 2003 (IDC, 2001).

The sector covers a wide set of applications and processes, including computer-based learning, web-based learning, virtual classrooms, and digital collaboration.

International Status

Essentially, e-Learning encompasses the delivery of educational-related content via all electronic media, including online platforms (the Internet, intranets, extranets LAN/WAN), broadcast (digital analogue and interactive TV), and packaged based media (audio/video, CD-ROM and DVD-ROM etc.). Online learning describes learning via Internet, intranet, and extranet technologies. A basic online learning program includes the text and graphics of the course, exercises, testing, and record keeping, such as test scores and bookmarks. A sophisticated online learning program may include animations, simulations, audio and video sequences, peer and expert discussion groups, online mentoring, links to material on a corporate intranet or the Web, and communications with corporate education records etc.

The market can be divided into two main segments, namely corporate and educational. Both are attractive growth markets.

- ▶ *It is projected that the global corporate e-learning market will increase from US\$2 billion at the end of 1999 to greater than US\$23 billion by 2004, (68.8% Cumulative Annual Growth (CAGR)) (IDC, 2001). The US market is projected to grow from US\$2.2 billion in 2000 to US\$11.4 billion by 2003 (63% CAGR, 1998-2003) (PwC, 2002). In the US, the e-learning market which represented about 3% of the total US education and training market in 2000, is forecast to grow to approximately 15% of the total market by 2003. The European corporate e-learning market is projected to grow to \$4 billion by 2004 (PwC, 2002).*

³ Content authoring refers to the building of functions for content access, navigation systems, and edit and file management options.

► *PwC cite the education e-learning market as a high-growth emerging market. For example, e-Learning in US third level institutions alone is projected to be worth over \$750 million by 2004 (PwC, 2002).*

e-Learning is expected to drive corporate training expenditures. Information Technology currently accounts for 70% of e-learning, although financial management, employee orientation and product information are increasingly being taught through this method (PwC, 2002). e-Learning suppliers are marketing their products and services and major information technology vendors are also helping to drive the market.

While the global e-Learning market is crowded, it is also diverse, with a wide variety of companies in the sector. An organisation that designs off-the-shelf online courses is accurately described as an e-Learning supplier, as is a company that builds software to track these courses, yet the two have little in common.

First generation e-learning taught traditional courses over the web. Next generation courses, called performance or business simulation re-create actual business conditions and problems. Future developments in e-Learning include; the emergence of e-Learning suites including collaboration, content, testing and assessment, skills and competency, and Internet video based training. e-Learning suites can help enterprises solve integration problems, and reduce costs associated with expensive integration projects.

The e-Learning industry, has been slower to develop than anticipated, and, like the technology sector as a whole, experienced a downturn over 2001/2002. However, this is seen as short-term.

In terms of the educational side of e-Learning, to date, traditional school educational publishers have not relied on the Internet for revenue, but are well positioned to benefit from new revenue opportunities as the Internet integrates into everyday educational teaching and learning methods.

Ireland

Ireland's early entry into this market has meant that it has developed a strong international reputation across the e-learning value chain which can continue to be exploited to ensure the future growth of the sector. With approximately 37 companies, this is Ireland's most successful digital content sector to date (PwC, 2002).

There are a substantial number of internationally recognised indigenous companies, all of which have developed/emerged in Ireland. A number of significant international players have also been attracted to Ireland. This has resulted in the development of a strong e-learning skills base in Ireland and an international reputation for Ireland as a leader in this sector. The sector has also been aided by the animation and web design skills that exist in Ireland, which are utilised in the sector. In addition, a significant level of e-learning research is being undertaken in third level institutions in Ireland.

Currently, Irish companies in this space are providing full end-to-end solutions, and as such, skills are in place across the entire value chain. In particular they are operating in the high-value technology enabler space primarily in the areas of content creation, web content management, and document management. Into the future, market opportunities for Ireland are anticipated to emerge right across the value chain.

2.4. Business and Consumer Telematics/Wireless Services

The Sector

Telematics/wireless services include both mobile Internet and location-based applications, including games, directories, and messaging facilities.

The use of telematics/wireless communications technologies to access network-based information and applications from mobile devices is still in its infancy. Yet, this area has significant potential due to the level of global take-up of mobile devices, primarily mobile phones, but also personal digital assistants (PDAs), and other such systems. Total European mobile content and service revenues are projected to grow from \$5.6 billion in 2002 to \$44.23 billion in 2005 (PwC, 2002).

International Status

Regional variations exist in how mobile telematics/wireless services will be used. These arise from differences in network availability, the current state of technology deployment, social and cultural factors, and income levels. The success of NTT DoCoMo's i-mode in Japan has provided an indication of the type of applications that may be successful. These services however, may not transfer globally.

Telematics/wireless services fall into four categories, defined by the user. These categories are not strongly differentiated because many applications that can be used by the consumer can also be used by the professional.

1. Consumer – applications designed to be used by individuals in their personal lives. They include entertainment (games/gambling etc), booking travel and entertainment (flights, cinema etc), financial transactions and, location-based services such as finding specific shops or services in a city etc., access to news and information, person-to-person messaging and email, and mobile commerce transactions.
2. Mobile Professional – applications useful to a broad range of employees regardless of their industry or role. These include access to enterprise email, calendaring and scheduling, time and expense reporting, business-related travel, and business-to-employee (B2E) applications including access to employee portals, HR systems, and routine office functions.
3. Functional/Vertical – applications designed to be used by specific industry sectors or roles. These typically comprise systems extended for the mobile environment rather than those created for it. Most common examples include mobile sales applications or specific industry applications such as medical or travel systems.
4. Industrial – these applications have additional characteristics that separate them from the functional/vertical category. They typically involve special-purpose computing devices and applications that are designed primarily for data capture rather than interaction. Examples are data capture in the parcel tracking business, and wearable computers in the car rental business, etc.

Directory services are increasingly integrated into telematics/wireless services. An enormous range of information is available through mobile devices, such as city information guides etc. In the future, directory services are expected to have transactional capabilities.

Telematics/wireless services require 2.5/Third Generation (3G) wireless data networks. The downturn in the telecommunications sector has limited the capital available for operators to build the infrastructure needed for 3G broadband wireless. The expensive 3G spectrum auctions and multiple standards have also delayed this infrastructure roll-out in Europe and the US. However, analysts believe that wireless investments will pick up in late 2002 and increase through to 2004 as the investments are made to upgrade to 2.5G and 3G standards (PwC, 2002).

One of Europe's key successes has been mobile telephony. The US has to date been behind Japan and Europe in the wireless race. In the US, mobile operating systems are varied in technology, markets are fragmented and mobile phones have yet to reach the levels of penetration that they have reached in Europe and Japan. However, the US environment is changing and is increasingly beginning to threaten Europe's mobile dominance (PwC, 2002). There are a number of key reasons for this:

- ▶ *European wireless operators are currently facing huge debts following the 3G auctions;*
- ▶ *Wireless Application Protocol (WAP), in which both telcos and content creators invested significant amounts of money, failed to appeal to achieve mass market take-up in Europe;*
- ▶ *In the US, wireless local area networks (WLANs) and (Wi-Fi) that provide wireless access to the Internet at broadband speed within a confined area, are hugely popular;*
- ▶ *US consumers have embraced wireless data devices while most hand-held computing machines are being turned into wireless phones with add on antenna;*
- ▶ *Third Generation is also now looking more likely to be launched earlier in the US than Europe due to CDMA 2000 network technology.*

Ireland

Revenue from voice services in the mobile market, which is the current driver of profit, should peak in 2002 and then begin to fall as markets become saturated and increasing competition continues to drive profits lower (PwC, 2002). In this scenario data services such as mobile Internet, e-commerce and e-mail, will become critically important to network operators as they strive to identify new sources of revenue. Nokia for example estimate that voice accounts for approximately 95% of revenues at present but project that by 2005 mobile Internet services will account for around 60% of total revenues. The total European mobile content and service revenues are projected to grow from €5.8 billion in 2002 to €45.6 billion in 2005 (average annual growth of 228%) (PwC, 2002).

There are few mobile digital content service providers targeting the consumer market in Ireland. The recent downturn in the telecommunications sector and the relative failure of wireless application protocol (WAP) have resulted in a number of start-ups in this area failing to attract sufficient market demand to sustain operations. In addition, issues have arisen in relation to the availability of platforms on which to distribute content, and the revenue share from doing so. Meanwhile, the difficulties associated with identifying market demand for consumer wireless services have further limited the growth. Ireland does have a high level of strength in the business wireless market, however, and the skills developed in this area could be readily transferred to the consumer market.

An analysis of the sector shows that Ireland currently has research and market strengths in technological enablers (principally mobile/access devices) and design of digital content together with market strengths in content authoring (PwC, 2002). Going forward, there will also be opportunities to engage in content management, storage and publishing in this sector.

2.5. Non-Media Applications

The Sector

Non-media applications typically incorporate high-end imaging, design and virtual reality technology tools and applications, developed for scientific and industrial use. Aside from entertainment, digital content enabling technologies are aiding the development of a range of industrial and scientific applications across the medical, automotive, aerospace, and petrochemical sectors.

Indeed, the production of digital content-based applications for the scientific and industrial sectors is expected to have high-growth potential globally in both the development of technology enablers and content creation itself. These are high value-added, high-skilled areas of operation and highly attractive sectors for Ireland.

International Status

Among those professions currently using digital content for non-media applications are architects, engineers, and drafters. Those in the creative design arena have used digital computer-based imagery extensively for the past decade, primarily through the use of CAD (computer-aided design) software for precision drawings or technical illustrations.

In addition to two and three dimensional (2D and 3D) modelling, further developments are occurring in Digital Content enabling technologies, such as the ability to create photo-realistic renderings from 3D CAD data, and to simulate interactive behavioural responses. Many of these advances have contributed to the high-tech area of virtual reality (VR), which is expanding the role of digital media in areas such as product design, medical and military training.

In the business world, the financial and practical considerations of Digital Content enabling technologies such as virtual reality (VR) have proved to be significant constraints, with more advanced technologies failing to make an impact on the mass market. This could now be changing. Over 2001-2002, the interest in VR has noticeably increased and the emergence of serious business applications is attracting new investment (PwC, 2002).

VR is the simulation of a real or imagined environment that can be experienced visually in the three dimensions of width, height, and depth. It may additionally provide a visual interactive experience in full real-time motion with sound, and possibly tactile and other forms of feedback. The uses of virtual reality can be divided into two main categories:

- ▶ *The simulation of real environments such as the interior of a building, often with the purpose of training or education; and,*
- ▶ *The development of an imagined environment, typically for a game or an educational adventure.*

VR is a high spec science, technology and design application sector. Development costs are high and for this reason it has been most used in the aviation, medical and military sectors to date. NASA in the US for example, has been particularly active at the very high-end of this area. A range of universities and colleges worldwide have also been undertaking extensive R&D on the technology and software for this sector, for example, Media Lab Europe in Dublin, Massachusetts Institute of Technology and the Electronic Visualisation Laboratory (Chicago) in the US.

The simplest form of virtual reality is a 3D image that can be explored interactively at a personal computer, usually by manipulating keys or the mouse so that the content of the image moves in some direction or zooms in or out (i.e., relatively standard CAD and other digital media applications). Most of these images require installing plug-in software for viewing the images on an Internet browser such as a virtual reality mark-up language (VRML) browser. More sophisticated efforts involve approaches such as wrap-around display screens, actual rooms augmented with wearable computers, and haptics joystick devices that let you feel the display images. Popular products for creating virtual reality effects on personal computers include Bryce, Extreme 3D, Ray Dream Studio, trueSpace, 3D Studio MAX, and Visual Reality.

Although often associated with entertainment, VR has much to offer the business world, particularly through cost savings and performance enhancement. It can also be applied as a communication tool. VR however, has an "image problem" and many companies are now dropping the term, now producing "visualisation", "simulation" or "replication" systems. Other common terms include Synthetic Environments (SE), real-time graphics (RTG) and interactive 3d (i3D).

To a large extent, the industry's development was delayed during the 1990s, as computing power was not available, applications were slow and graphics were poor. VR has largely been confined to research laboratories and specialist early adopters such as the military and aerospace. Other potential business users were deterred by the costs involved, and in addition, "single applications" was a problem, i.e., a one-off project or demonstration. Ensuring delivery of multiple applications is critical.

Ireland

VRs are particularly suited to medical, aerospace, petrochemical and automotive sectors, where even basic 3D visualisation can achieve significant cost and time saving. Virtual reality has two key areas where it has more 'serious' applications namely, industrial design and medical training.

Currently, there are a number of Irish companies engaged in this type of work, although predominantly in the 'lower' skilled areas. With respect to research in these areas, there are a number of projects taking place at the more scientific level, which are generating related skills.

This is an area PwC views as being of high attractiveness to Ireland based on the high-growth potential of the sector globally and the high skilled, high value-added nature of the work involved. It is also a key area, which could be stimulated in the market through the encouragement and sponsorship of R&D initiatives at third level.

At present, Ireland has market and research strengths in enablers content development and design, together with market strengths in the authoring, packaging and management of digital content. Building on current capabilities, Ireland can access significant market opportunities in these areas over the next few years.

3 Recommendations

Sector specific development strategies focusing on the high potential areas highlighted in the preceding chapter will have a vital role to play in developing the digital content industry in Ireland. However, cross-sectoral measures must also be taken to ensure that the overall environment is conducive to the development of such an industry.

The identification of policy recommendations for the sector in Ireland was based on an examination of digital content policies implemented in four lead countries in this area (France, the UK, US and Canada) and, on an evaluation of the strengths and weaknesses of the Irish digital content industry, including an assessment of the challenges in the business environment that supports digital content indigenous development and inward investment.

In addition to this analysis, a workshop was held with both digital content industry representatives and policy-makers to gain their input on: the environment for digital content in Ireland; the necessary factors for the development of a sustainable Irish industry; the current impediments/challenges to growth of the industry in Ireland; and, potential policy recommendations.

In the section that follows, key issues and recommendations emerging from this process are set out under eight specific policy action headings.

3.1. Funding and Finance

There is a critical lack of funding to support the development of digital content enterprise in Ireland at present. A review of some of the fundraising activity that took place in 2001 and to date in 2002 points to acute difficulties for digital content companies in securing finance (PwC, 2002). This is partly attributable to investor caution in relation to IT industries in general, but also a lack of knowledge of the digital content industry and the risks and rewards associated with it.

Ireland currently has no specialist digital content venture capitalists.

Without State intervention in the funding area in the short-term, it will be difficult to develop a base of digital content companies on which to found the creation of a strong, internationally competitive industry in Ireland.

The following actions are recommended:

- ▶ *A specialist venture capital fund for the digital content industry should be established, similar to the fund established for the biotechnology sector in early 2002, to support funding requirements at all stages of business development (Enterprise Ireland, IDA Ireland, DETE).*
- ▶ *Investigate further whether a significant international venture capital company with specialist knowledge and experience in supporting digital content enterprises can be attracted to Ireland (Enterprise Ireland, IDA Ireland).*

3.2. Research and Development

Research and development is of critical importance in the digital content industry. Due to the continual evolution of technology and the importance of advanced content and technical capabilities in establishing competitive advantage, continuous R&D is required to remain at the cutting edge of the industry.

At present, there is a need to focus on encouraging digital content R&D at both academic and enterprise level in Ireland.

Looking specifically at the academic research area, there are currently low levels of research undertaken in integrated creative and technological areas in the major creative colleges, and there is a lack of advanced basic research for long-term digital content developments (PwC, 2002). These low levels are mainly due to insufficient funding being made available for digital content related projects. Although there are a number of programmes of R&D support for third level institutions in Ireland, aside from Enterprise Ireland's Informatics Research Initiative⁴, none of these are specifically directed towards digital content.

At enterprise level, there are two key R&D supports currently available – Research Technology & Innovation Competitive Grants and R&D Capability Grants. However, these are not specific to digital content.

The following actions are recommended:

- ▶ *A programme should be introduced, possibly under the existing Informatics Research Initiative, to support art and creative colleges to develop R&D specialists in digital content creation, design, etc. Development funding should also be provided for colleges to undertake R&D initiatives in the targeted sectors identified in the previous chapter (DETE, Enterprise Ireland, ICSTI).*
- ▶ *The criteria for awarding Research Technology and Innovation funding should be reviewed and modified if required to enable the support of content development and mastering initiatives. In the event that this is not possible, the establishment of a similar initiative for content development should be investigated (Enterprise Ireland, IDA Ireland).*

3.3. Legal and Regulatory Environment

Ireland is a forerunner in providing a supportive legal and regulatory environment for ICT related sectors and has some competitive advantage. The most important elements of the legal and regulatory environment for digital content include the Electronic Commerce Act, 2000, the Copyright and Related Rights Act, 2000, the Data Protection Act, 1998, the Data Protection (Amendment) Bill 2000, the Trade Marks Act, 1996, and the Communications Regulation Act, 2002. However, there are a number of areas where our legislative regime needs to be strengthened.

PwC research indicates that indigenous digital content enterprises do not protect their intellectual property (IP) as well as is required. This was evidenced during the “dot com” era with many website owners not acquiring the rights to their sites from web developers. It is crucial for indigenous digital content enterprises to protect their intellectual property, if they are not to run the risk of losing these assets to larger/international companies.

There is a separate difficulty for digital content companies in Ireland in creating digital products using content from other sources. At present, the Copyright Act provides for a complex licensing scheme. This can be slow and cumbersome, resulting in the parties having to make unnecessary recourse to the courts.

A further difficulty in this area is that digital content companies must rely on the Law of Confidential Information to protect their know-how. This is a form of Civil Law. PwC recommend that a Statutory regime would provide stronger protection.

⁴ One of the six Programmes in Advanced Technology (PATs) run by Enterprise Ireland.

The following actions are recommended:

- ▶ *A marketing/education programme should be implemented to encourage digital content SME registration of IP as appropriate in order to drive awareness of opportunities to exploit, and the need to protect, IP (Enterprise Ireland).*
- ▶ *Increase the statutory protection provided to the digital content IP through the introduction of a law on theft of confidential information (Department of Justice).*

3.4. Fiscal Environment

In terms of the fiscal environment, Ireland compares relatively favourably with the four case study countries examined as part of the research, with regards to incentives to support digital content. However, this is due to the generally pro-business tax environment in Ireland rather than due to specific fiscal incentives for digital content enterprises.

One significant tax issue for digital content companies relates to Ireland's VAT regime. When an enterprise located in Ireland completes the sale of a digital content product online such as a CD, 21% VAT will be applied. This enterprise will be at a distinct competitive disadvantage to one which is located outside the EU selling the same CD but without VAT.

This position is due to change from 1 July 2003 under the recently published EU Directive. The Directive will require non-EU vendors to collect VAT on electronically supplied services purchased by non-business EU residents. The scope of the Directive includes digital content products such as software, computer games, publications, music, videos, and fee-based broadcasting services. Electronic supplies by non-EU established vendors would be taxed on a destination basis, under the administrative rules and tax rates applicable in the member states where the customers reside. The Directive contains a 'special scheme' under which non-EU vendors with customers in more than one Member State need only register with a single Member State with the VAT revenues distributed to the Member States where the customers reside.

These new rules do not apply to EU based suppliers. An EU supplier, who sells goods over the Internet to EU private customers, must account for VAT in the Member State in which the supplier is established. The implication of these changes for Ireland is that non-EU suppliers are likely to consider creating an establishment within the EU from which to supply their EU private customers. Some EU-based businesses may also feel that relocation within the EU to lower VAT-rate jurisdictions is necessary to be competitive with non-EU vendors. The 21% standard rate of VAT in Ireland is among the highest in the EU and could potentially place Ireland at a competitive disadvantage.

The following actions are recommended:

- ▶ *Ireland's VAT rate should be progressively reduced in line with that of other European countries with the objective of ensuring that it does not place Ireland at a disadvantage for digital content enterprise and market development. (Department of Finance, the Revenue Commissioners).*

3.5. Infrastructure

Broadband telecoms infrastructure is a key enabler of the digital content industry since high bandwidth is required for both the provision and use of digital content and applications to become widespread.

While digital content will predominantly develop as an export-oriented industry, lack of cost-effective broadband services is currently a barrier to the development and delivery of services and applications

and will serve to erode the international perception of Ireland as a knowledge-base/digital economy thus negatively impacting on content inward investment opportunities.

Currently, Ireland is lagging behind its international counterparts in terms of broadband rollout (Forfás, 2002). This is an area that needs to be addressed immediately to ensure that we do not fall further behind.

Given continued growth in internet traffic and the need for peering, internet exchange facilities, which provide backbone services, are becoming a vital element of internet infrastructure. These facilities both enhance the flow of traffic and increase security by providing new public peering points. Moreover, they allow companies access to an open marketplace where they can exchange traffic and negotiate among themselves, without interference from the site provider.

The following action is recommended:

- ▶ *There is an urgent need for key participants to co-operate in establishing an effective international Internet exchange facility (Telecom Operators, Internet Service Providers, IDA Ireland).*

3.6. Education and Skills

Digital content is a high-tech, high-skills industry, but as technology becomes commoditised, the key factor that will differentiate a company's products and services will be its skills base. Information technology and creative skills represent a key competitive advantage in the development of a vibrant digital content industry, at both national and company level.

Measures are needed to ensure that the output of the educational system (at primary, secondary and third level) can help meet the current and future skills required to develop and sustain a leading position in digital content industries.

Furthermore, at an enterprise level, PwC research indicates that there is a shortage of skills in high-growth and targeted areas of the digital content industry, such as wireless, games, computer generated animation, in addition to a need to strengthen business skills for developing a strong position in digital content global marketplaces.

The following actions are recommended:

- ▶ *Complete a detailed audit of skills requirements for the digital content industry (Expert Group on Future Skills Needs).*
- ▶ *Introduce bursaries for students to study in leading international digital content colleges in order to develop skills in targeted sectors (Third Level Sector, IDA Ireland, Enterprise Ireland).*
- ▶ *Encourage international competitive placement programmes as a means of providing student placements in leading companies in targeted digital content sectors (Enterprise Ireland, IDA Ireland and FÁS).*
- ▶ *Develop digital media management courses to meet the skills required for digital content enterprise, in project management, finance, and international sales and marketing (DES, FÁS).*
- ▶ *Incorporate as appropriate in computer science programmes a creative component on the curricula (Department of Education and Science, Third Level Colleges).*
- ▶ *Encourage initiatives at both primary and secondary level to encourage 'innovation and creativity' at an early age (Department of Education and Science).*
- ▶ *Introduce initiatives to promote careers in digital content (for example, the introduction of mobile multimedia training studios/road shows) in schools and careers advisory services (Department of Education and Science, Institute of Guidance Counsellors).*
- ▶ *Develop measures to attract home Irish talent in overseas markets with specialist digital content skills (Expert Group on Future Skills Needs, Enterprise Ireland, IDA Ireland).*

3.7. Enterprise Development

Ireland has an opportunity to become a leading content location over the next few years. But for this to happen, measures need to be taken to stimulate and develop both the production and consumption of digital content in the short to medium-term.

There is a need for the Digital Hub, located in the Guinness Hop Stores area in Dublin, to develop an attractive proposition for both foreign and indigenous digital content companies. This will require a number of issues to be resolved, most significantly the costs of broadband services and accommodation within the Hub area.

Furthermore, at present, there is a lack of awareness among corporate organisations of the benefits of digital media and how it can positively impact their business. If this issue could be addressed, using the Digital Hub as a showcase for potential, these companies represent a nascent market for digital content enterprise in Ireland.

Given that digital content is about the convergence of the creative traditional entertainment and media sectors; with information, communications and technology sectors, there are a number of Government Departments and agencies involved in the development of the industry. This has not optimised the level of cohesion in the way in which policy can be developed and implemented across the digital content industry.

The following actions are recommended:

- ▶ *The Department of Enterprise, Trade and Employment supported by Forfás, will establish a digital content steering group, comprising the industrial development agencies and relevant Government Departments to guide and co-ordinate the development of the sectoral strategies for specific niches and to progress implementation of the actions in this report. Strategies to establish effective linkages with centres of excellence in digital content internationally should also be developed and pursued.*
- ▶ *The Digital Hub should be developed as a "showcase" for digital content in order to market the capabilities and benefits of digital media/content to the corporate sector in Ireland and internationally (Digital Media Development (DMD), Enterprise Ireland, IDA Ireland).*

3.8. Public Sector Projects

As the digital content market is an emerging one, there is a critical need for the application of market creation interventions in order to drive its development. The establishment of a number of State 'Digital Library' projects would offer enormous opportunities to Ireland's digital content industry. Moreover, some of these initiatives could be undertaken in conjunction with the Digital Hub.

As well as encouraging the development and growth of new digital content products and services, there is also a role for the public sector to help in exploiting more effectively Ireland's existing digital content and publishing resources such as broadcasting and publishing, including those in State control since these sources can serve as a catalyst for the industry's development in Ireland.

The following actions are recommended:

- ▶ *The public sector should commission a number of state Digital Library projects to help promote the information society, raise awareness among the corporate sector of the benefits of digital content and to serve as demonstration projects for Ireland internationally (Department of Arts, Sports and Tourism).*
- ▶ *Existing content companies in the broadcasting, media and publishing industries, particularly State-owned companies should be encouraged to move towards the digital creation, management and distribution of their content (Department of Communications, Marine and Natural Resources).*

4 Conclusions

There is a real opportunity for Ireland to develop a significant strength in digital content industries of the future, and to develop strong digital content clusters of high-growth, high-value digital businesses. The targeted clusters should be in digital content sectors which have been identified as opportunities for Ireland. These include digital games, e-Learning, non-media applications, telematics/wireless services, and digital libraries. These sectors will build on Ireland's existing digital content strengths and expertise at research and enterprise level, to develop a sustainable competitive advantage and a strong global market positioning.

Success in leveraging these opportunities will be dependent on a number of critical factors. These include: proactive targeted development by the industrial development agencies and Government of high- growth high-value sectors; Government sponsorship of specific projects/initiatives to act as a catalyst for skills and market development; establishment of education and training facilities in areas where there is an identified shortfall of skills going forward; accelerated development of Ireland's telecoms broadband infrastructure and R&D; improved access to finance/funding for digital content enterprise; and, the continued support for a 'pro-digital content' business environment.

The recommendations presented in this report are aimed at realising Ireland's vision to become a competitive player in the emerging digital content industry. If successfully implemented, they can enable Ireland to take advantage of the current "window of opportunity" as the industry emerges.

Glossary

Backbone

A high-capacity network that links together other networks of lower capacity, usually local area networks.

Bandwidth

(Also known as 'capacity'). In simple terms, how much information or traffic can be carried on the telecoms infrastructure in a given amount of time. The simple rule is that the greater the bandwidth, the greater the opportunities for commerce.

Broadband

A high-speed telecommunications link allowing transmission at 2 Mbit/s or higher.

CAD

Computer Aided Design – using computers to aid the design and drafting process.

Digital

The use of a binary code (ones and zeros) to represent information.

Digital Asset Management

DAM encompasses the strategies, technologies and processes required to create, store, retrieve, approve, distribute and leverage rich media content such as video, audio, images and graphics, as well as text.

Digital Media/Content

Sound, pictures, text and video available in digital format for downloading or streaming across the Internet or other network.

Digital Rights Management

DRM enables the secure sale, distribution, and appropriate use of Digital Content. DRM focuses on the access rights, prices, and distribution rights that surround the content. It also deals with areas such as Public Key Infrastructure.

Email

Messages sent in digital form via the Internet or a private network.

Extranet

A private network that uses Internet-based technology to link companies with suppliers, customers, and other partners.

ICT

Information and Communications Technologies are an intertwined set of technologies and services that mutually reinforce expanded benefits and efficiencies.

Internet

The interactive global network linking millions of computers, transmitting, storing and providing information for users.

Intranet

Based on Internet technologies, an internal network that operates much like the World Wide Web, accessible only to employees and other authorised users and protected by a firewall.

LAN

Local area network – a network in a building or on a site usually used to connect computers together.

Mobile

An abbreviation commonly used for mobile cellular communications – referring to mobile telephone networks.

Multimedia

The combination of sound, music, text and graphics in a way that encourages interactivity and a dynamic use of web-based content.

Peering

Arrangements made between Internet Service Providers and Internet Exchange Administrators for the exchange of data traffic at Internet exchanges.

Third Generation Mobile Services (3G)

The third generation of mobile telephony (known as Universal Mobile Telephone Service in Europe) is designed to be a worldwide broadband, digital system. It will offer wireless Internet access, moving video images, two-way text communication, and on-line transactions. Analogue and digital (e.g. GSM) systems were the first and second generations of mobile, respectively.

WAP

Wireless Application Protocol – a protocol that enables Internet services to be delivered to small screen mobile devices.

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