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DIGITAL BROADBAND CONTENT: PUBLIC SECTOR INFORMATION AND CONTENT

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FOREWORD

This report was presented to the Working Party on the Information Economy in June 2005 and December 2005, and was declassified by the Committee for Information, Computer and Communications Policy in March 2006.

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SUMMARY

Public bodies hold a range of information and content ranging from demographic, economic and meteorological data to art works, historical documents and books. Given the availability of information and communication technologies (ICTs) public sector information can play an important role in producing innovative value-added services and goods. Furthermore, these technologies also provide a wider population better access to educational and cultural knowledge. Both commercial opportunities and the wider spread of information have positive economic and social benefits.

Knowledge is a source of competitive advantage in the "information economy", for this reason it is economically important that there is wide diffusion of public information. Governments also have a basic commitment that citizens have to access national cultural heritage such as paintings, monuments and books; and this is also important for social inclusion. To contribute to better conditions for learning, the digitisation of cultural and educational resources is fundamental. New communication tools, such as interactive Web sites and games, often also reach groups of people with no previous interest, notably if they allow personal participation. OECD countries have recently initiated many programmes which use these tools for cultural and educational content. The main emphasis of policies has shifted to improving access to available resources, and preservation of content created digitally ("digitally-born") receives increasing attention.

Public Sector information (PSI) constitutes the "raw material" for a variety of products and services in applications across a wide range of industries, and analysis has concluded that it is an important economic asset. This study gives an overview of the main areas of PSI and their commercial applications. Currently geographic and meteorological information have the greatest economic potential; and so far their use has had positive impacts on employment and growth. Specifically combining various types of PSI has led to the development of innovative products such as location-based services. Technological innovation including the development of mobile networks open up further markets for PSI-based services, and better data quality and *e.g.* increased interoperability open up cross-border services. Industry structure has also been affected by ICTs; often higher value added producers have taken the place of previous intermediary distributors in the production value chain. Further, the roles of public and private firms are changing and the growth of mobile services markets stimulates the development of PSI business re-use further.

To develop competitive PSI markets, most OECD countries have attempted to ensure private service providers face the same conditions as public institutions, enabled private sector access to public data and clarified conditions under which these data can be used. For example portals have been developed that provide an overview of available PSI and conditions for use. Important questions are: which access regimes and re-use arrangements maximise the positive economic and other benefits of PSI, and which may for example develop commercial activities based on government-created content/data.

In some OECD countries access regimes allow commercial re-users have cheap and readily available access to PSI. They then add value to the public data and re-sell it to firms and consumers. Some studies argue that such open access regimes improve competitive market conditions for PSI re-use, stimulate economic growth and create jobs. However there are also arguments that commercial re-users may have low-cost access to data which was costly to create for the government, and that taxpayers may pay twice for the PSI content (once for creation of government content, and the second time when purchasing the content from a commercial re-user, although provided re-use is non-exclusive, users can also go to the original source for the original information, presumably at lower cost, but without value-added services).

On the other hand, in other OECD countries, there are access regimes where the public sector holds public sector information for its own use or employs cost-recovery strategies that allow only limited and potentially expensive access. In this scenario there are arguments that potential consumers of this data may have only restricted access to it, and that this approach is more costly to the consumer and for the taxpayer. Moreover, the potential economic gains from development of new commercial activities based on PSI re-use may be foregone. The economic and equity arguments surrounding commercial re-use of public sector information and content are complex and deserve considerably more analysis and policy attention.

If public sector content is to be more widely available through ICTs, it is crucial that cultural institutions have adequate in-house capacities and sustainable financial resources for digitisation. In many countries the cultural sector has faced cuts in public funding, and efficient digitisation has been a challenge for small and regional institutions. While public resources will remain important, private-public partnerships and the development of e-learning markets provide alternatives to finance content digitisation. Public sector information can also be sold and monetized to develop self-sustaining revenue streams helping data creation and digitisation efforts. Networks and interactive communities are also important because they allow cost reductions along the lines of open software development. With respect to copyright many challenges for content preservation and diffusion arise.

This study addresses challenges and related policy issues with respect to both PSI and public sector content. It is a first review of the area of public sector information and content and it is proposed that follow-up work be carried out in this area, particularly on the economic and distributional aspects of different access, cost, pricing and distribution models for public sector information and content.

INTRODUCTION

This study analyses the growing importance of public sector information (PSI) and content as part of the digital broadband content work programme, following studies on scientific publishing, music, online computer and video games and mobile content and analysis setting out digital content strategies and policies [DSTI/ICCP/IE(2005)3/FINAL].

The public sector is a big producer and collector of a large variety of data/information and content. Combining these resources with ICT capabilities allows realising a variety of innovative services and products. Moreover, public content can be more widely spread to reap important economic and social benefits.

There are two main technological developments that have changed and shaped the role of public sector information and content. These are *i)* technologies that enable the digitisation of public resources and *ii)* the deployment of broadband technologies as these constitute a means of rapid dissemination.

Digitisation is a crucial factor for both the commercial exploitation of PSI and public sector content diffusion. Once digitised, information and content becomes more manageable, transportable and exchangeable which brings along new opportunities but also challenges for the public sector regarding information management and content preservation. The innovations of content digitisation and Internet dissemination have transformed the business of content distribution and reinvented the way firms, public organisations and governments interact with each other and the public at large. Moreover, the public sector can be considered a role model in digitising content and making it available on line, it thereby encourages private institutions and individuals to do likewise and further expand the role of the Internet as an information and content source.

New technological possibilities have also introduced new tools for the diffusion of cultural and educational content. The efficient use of ICTs can improve the outcome of programmes which seek to achieve certain socio-economic goals such as, for instance, social inclusion and the provision of learning facilities. This analysis specifies these possibilities and gives an overview of the large variety of projects that have been implemented in OECD countries. The most important challenges (*e.g.* required funding and capacities and the impact of intellectual property rights) will be discussed. The Internet has provided a virtual space where large quantities of "cultural" material are deposited on a daily basis but much of this material relies on short-lived technologies. The questions this raises for preservation and how they have been addressed will be a further focus of this discussion. Finally, the report will look at some solutions and projects that have been implemented to deal with challenges in order to improve the spread of public content.

Definitions

Public sector information (PSI) and content is any kind of information that is produced and/or collected by a public body and is part of the institution's mandated role.

There is no standard terminology for the whole information/content and its subsets. For instance, whereas in Korea reference is made to "public knowledge information resources", in the United States the

terms "public information" and "government information" are widely used. Further, PSI is often used as an umbrella term for all content produced by public bodies.[1]

This study differentiates between:

- *Public sector information* which often has characteristics of being: dynamic and continually generated, directly generated by the public sector, associated with the functioning of the public sector (for example, meteorological data, business statistics), and readily useable in commercial applications; and

- *Public content* which often has characteristics of being: static (*i.e.* it is an established record), held by the public sector rather than being directly generated by it (cultural archives, artistic works where third-party rights may be important), not directly associated with the functioning of government, and not necessarily associated with commercial uses but having other public good purposes (culture, education).

The first category comprises public sector "knowledge" which may be the basis for information-intensive industries; these employ the raw data to produce increasingly sophisticated products. The second refers to cultural, educational and scientific public knowledge; wide public diffusion and long-term preservation (*e.g.* via museums, libraries, schools) which are major governmental objectives. However these distinctions are not clear-cut and there is a continuum of uses and applications between the ends of the spectrum (*e.g.* meteorological information with high commercial use, and particular cultural archives with very limited popular interest). The main objectives of re-use at the two ends of the spectrum are different although for example cultural and educational information is increasingly used to produce commercial products.

Objective, approach and scope

The objective of this study is to illustrate the economic importance and variety of PSI and its main commercial applications and to explore practices to preserve and to make public sector information and content accessible. For this purpose, the study:

- Develops a taxonomy of different types of PSI and public content to help identify their similarities and differences.

- Analyses particular domains of PSI to increase understanding of business sector value-adding activities and looks at existing public content projects and programmes and relating challenges.

- Discusses benefits of ICTs for preservation and diffusion of public sector content specifying opportunities to promote social and economic benefits and particular challenges.

- Identifies main policy issues in these two areas and discusses solutions and further research.

The analysis mainly relies on case studies, replies to the policy questionnaire of the *Information Technology Outlook 2006* and other quantitative and qualitative information. However there is an absence of robust quantitative data on the economics of cost, pricing and distribution models of PSI and the socio-economic gains of improved access to public cultural, educational and other content.

Scientific information and research data is not included in this analysis as it has been a separate digital broadband content study (OECD, 2005c). The OECD is also working towards "Guidelines for Access to Research Data from Public Funding", and these are not explicitly covered. However it is

recognised that universities (which can also be in a completely private sector environment) are major users of public data, for example health data with significant impacts on both public and private sectors, and government-funded research establishments and universities are involved in setting up and maintaining databases that have significant economic impacts on the research environment (more efficient research data collection and use) and the private sector (commercial applications).

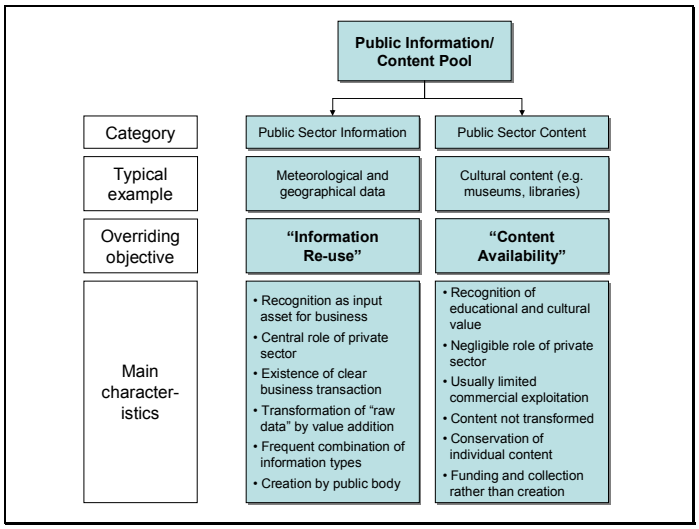
The topic of *public broadcasting* is also not covered in this survey. In many OECD countries there are fully or partly state owned broadcasters which are government financed or subsidised. These broadcasters produce content, which may be used by private companies or other public actors such as schools depending on access to content and usage rights. Public broadcasters also face the challenge of digitising and making their content more widely available (back archives and similar initiatives) and these issues warrant further in-depth analysis. It is proposed that this subject be covered in follow-up analysis of the economic rationale, advantages, disadvantages and effects of different cost, pricing and distribution models for public sector information and content, and in the analysis of film and video in the series of studies of changing digital content value chains and business models and their policy implications.

TAXONOMY AND STYLISED VALUE-CHAINS

Overview and categorisation

The public sector constitutes a major resource pool as it produces and collects a multitude of information. For public authorities this content – once collected and used for its original purpose – has two distinct dimensions as primary objectives and characteristics of each diverge (Figure 1). One comprises the aim to facilitate the commercial "re-use" of information. The other is concerned with public content diffusion and preservation for various socio-economic purposes.

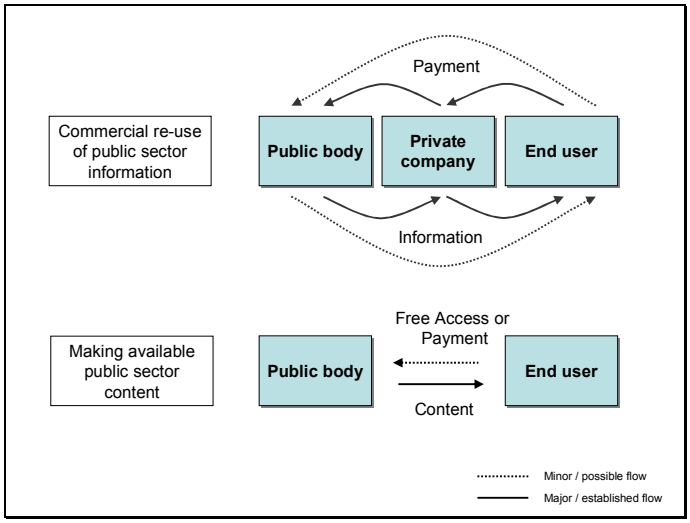
Figure 1. Categorisation and characterisation of the public information/content pool



Commercial re-use of public sector information

"Re-use" centres on exploiting the economic value of public information. PSI serves as "raw material" which can be used to develop new products and services. Whereas public bodies are the creators and suppliers of the original material, the private sector frequently plays an important role as intermediary in the capacity of information processor between source of information (public body) and end users (Figure 2). However, the use of ICTs has often made it possible for public bodies to integrate the value chain vertically and provide products directly to final users (see also the discussion on government exploitation of PSI below). Frequently the corresponding payment structure is such that payment occurs in exchange for information; where private companies pay for PSI and consumers for value-added information products and/or services. As substantial differences in PSI access conditions exist[2].

Figure 2. Typical information, content and payment flows



Making public content available

Public institutions are not only interested in potential "re-use" of collected information, they also invest in the dissemination and preservation of public content to realise various social and economic goals. As the main objective is wide diffusion, content has usually been freely available to private individuals and for educational purposes. Occasionally low prices were charged to recoup some of the costs. Traditionally, in many (but not all) OECD countries the private sector was often only marginally involved in efforts to make public sector content widely available (Figure 2 above). However, with increasing public resource restrictions, private industry and individuals have come to play a role in this effort; for instance, this has occurred in exchange for marketing possibilities (*e.g.* private concert sponsoring).

Different information and content types

The pool of public information/content and the public bodies involved in its creation and/or collection are highly diverse. For example, data is collected to support formulating regulation, to provide information for research, to preserve cultural heritage, to allow taxation or simply for registration and administrative purposes (APPSI, 2004). The public institutions involved are local and national governments, non-departmental public bodies, research organisations as well as executive agencies and international organisations.

Public information and content can be classified from government or user perspectives; but their diversity necessarily renders any classification imperfect. This study categorises public information and content by domains rather than by information-producing body.

Information and content domains

Public sector information and public content domains and examples are shown in Table 1. This list is neither exhaustive nor are individual domains exclusive. For example, the category "Natural resource information" includes information that can be part of "Scientific information" and "Research data" or "Geographic information"; moreover, it is difficult to draw clear divisions between cultural, educational and scientific content. Content types that are commonly used in commercial applications are geographic, meteorological, business and financial, social and transport as well as (some) legal system information. Cultural, educational and scientific information and political information are often directly made widely

available by governments. But, as Table 1 indicates the different domains are a continuum of examples rather than a mutually exclusive and collectively exhaustive classification system.

Table 1. PSI and Public Content domains with examples

Commercial re-use of PSI	Geographic Information	cartographic information
		land use info (cadastral data)
		spatial data/geographical coordinates
		administrative and political boundaries
		topographical information
		elevation data
	Meterological and Environmental Information	oceanographic data
		hydrographic data
		environmental (quality) data
		atmospheric data
		meteorological (weather) data
	Economic and Business Information	financial information
		company information
		economic and statistics
		industry and trade information
	Social Information	demographic information
		attitude surveys
		data on health/illness
		education and labour statistics
	Traffic and Transport Information	transport network information
		traffic information
		transport statistics
		car registration data
	Tourist and Leisure Information	hotel information
		tourism statistics
		entertainment (local and national)
	Agricultural, Farming, Forestry and Fisheries information	cropping/land use data
		farm incomes/use of resources
		fish farming/harvest information
		live stock data
	Natural Resource Information	biologic and ecologic information
		energy resource/consumption information
		geological and geophysical information
	Legal System Information	crime/conviction data
		laws
		information on rights and duties
		information on legislation
		information on judicial decisions
		patent and trademark information
	Scientific Information and Research data	university research
		publicly-funded research institutes
		governmental research
	Educational Content	academic papers and studies
		lecture material
	Political Content	governmental press releases
		local and national proceedings of governments
		green papers
Making available PSC	Cultural Content	museum material
		gallery material
		archeological sites
		library resources
		public service broadcast archives
		other public archives

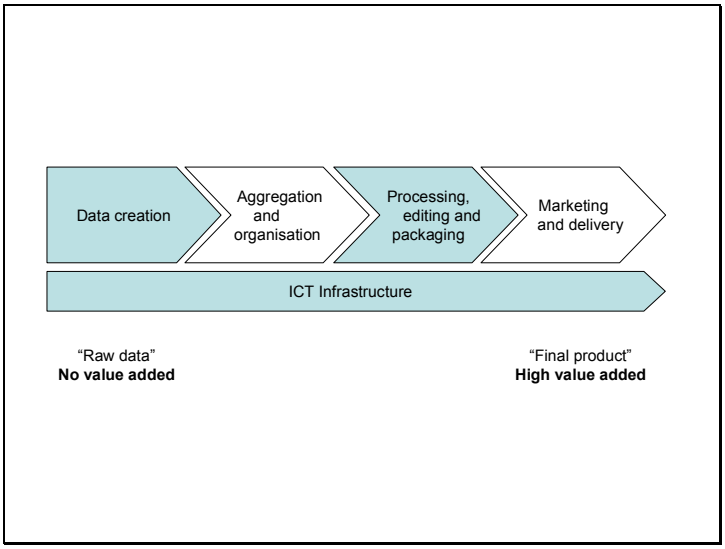
Source: OECD adapted from Pira, PSINet and other studies.

Stylised value chains

Value chain of commercial re-use of public sector information

The value chain of commercial re-use of PSI is composed of four elements; these are *i)* data creation, *ii)* aggregation and organisation, *iii)* processing, editing and packaging and *iv)* marketing and delivery (Figure 3). Today, most of these functions are based on ICTs. Enabling technologies such as the Internet and software solutions are not only the supporting systems but also the basis for the main value-creating functions. In fact, much of the re-use activity only started once ICT applications were available.

Figure 3. Elements of the PSI re-use value chain



Source: OECD adapted from Pira.

The very first element of the PSI value chain is the creation or collection of the data itself (*e.g.* the actual measurement of meteorological data). At this stage public information can be considered as "raw material". Subsequently, as a second step the information created at local, national or international level is aggregated and organised in order to create a more comprehensive data set and to permit joint storage and retrieval.

Among the most important PSI producing public bodies are:

Statistical offices which generate comprehensive data.

The company registrar which collects corporate financial data.

Mapping agencies that produce geographic data.

Meteorological services which generate weather data.

Ministries of transportation producing traffic data, and

Courts and other governmental institutions that provide legislative information.

These institutions originally generate this information and data as part of their mandated role to fulfil their public task.

The third element of the value chain comprises functions such as data processing, editing, re-packaging or re-modelling. Therefore, it includes a large variety of value-adding activities which depend on the end product or service. For instance, meteorological data can be used to produce weather forecast services for mobile phone users. Editorial activities including the production of synopses, explanatory notes and search indexes provide comprehensive legal information. With geographic data the real added value frequently arises from their combination with other information as demographic or traffic data. Examples of such innovative products are geo-marketing solutions and in-car navigation systems capable of increasing driver safety.

The final functions are marketing, distribution and delivery of information products and services. This may include activities such as advertising campaigns, Web site hosting and the provision of e-commerce. ICTs have not only augmented this market significantly, they have also transformed some of these traditional activities. An important example is public sector publishing. Traditionally public sector bodies tasked private companies extensively with publishing their informational material. The use of Internet as a communication tool has altered the importance of hardcopy publishing. For example, in Australia the Commonwealth Attorney-General's Department introduced and runs ComLaw, a database of federal government legislative material incorporating the Federal Register of Legislative Instruments. As public initiatives such as this one increasingly take over electronic publication of primary legal information, legal publishers have changed their main service offers to higher value-added products (ePSINet, 2004).

PSI can also become important for new wireless applications such as location-based services (LBS). So far the use of telematics/wireless communications technologies to access network-based information and applications from mobile devices is in its infancy. But the very large installed base of mobile phones and very rapidly growing wireless personal digital assistants (PDAs) suggests large potential applications.

Business models

There are four main types of government exploitation of PSI (Pira International, 2000). Categories 1-3 may be characterised as "public business models":

1. Public bodies perform all the functions along the value chain and the product or service is directly offered to end users.

2. The public sector employs the expertise of the private sector to support some activities along the value chain, such as typesetting, printing, creation and maintenance of Web sites and publishing.

3. Sometimes – especially when data is highly specialised or complex IT skills are required – partnerships with private companies are created.

4. Commercial "re-use" of PSI by private companies for their own gain.

ICTs potentially enable public institutions to provide PSI products directly to end users, but, at the same time, they provide opportunities for new value adding intermediaries. The importance of each of these business models differs by type of public information and by country. Whereas in the United States it is generally the private sector that adds value by producing information services out of public raw data, in Europe public administrations can be quite involved in producing value-added services. Apart from being producers of raw PSI and value-added products and services, public institutions can also be model producers and users of information. Standardisation and corresponding systematic improvements of public and private information management can result.

Approaches to PSI access

The conditions under which private businesses can use PSI differ across OECD countries and these have a major effect on market development.

In the past, OECD countries have taken different perspectives as to different access regimes. In the United States, public information policy allows open and unrestricted access to public information. A circular by the Office of Management and Budget (OMB, 1996) states: "…government information is a valuable national resource, and… the economic benefits to society are maximized when government information is available in a timely and equitable manner to all." The OMB establishes as guiding principle for federal agencies that *i)* all public information be actively disseminated without imposing restrictions or conditions, *ii)* access should involve costs only to the extent that those cover expenses of dissemination and *iii)* it establishes that advantage should be taken of the various dissemination channels (*e.g.* private and academic) as well as of available technologies (including Internet, satellite downcast, etc.; Weiss, 2002). In the US the commercial re-use of the data is left primarily to the private sector.

In Europe PSI is often seen as an asset to be exploited by the public sector. Access conditions diverge but many European public bodies and governments see the commercial exploitation of PSI as a welcome revenue stream. As a result, most countries price PSI higher than marginal cost. But in 1998 the EC formally recognised PSI as a key resource in its related Green Paper (European Commission, 1999) and has since enacted legislation providing certain agreed principles on making accessible PSI for commercial re-use (see below). In Korea initiatives to digitise and make accessible a broad range of public content are ongoing (see Box 1).

Box 1. Korea's Public Knowledge Information Resource Management Project

After initial focus on ICT infrastructure improvements, Korea has increasingly concentrated on broadband content issues. Aiming to convey good quality content on line, Korea has engaged in a comprehensive process of digitising those "*knowledge information resources*" that are considered to be of high public but low commercial value.

Korea established the "*Public Knowledge Information Resources Management Act*" in 2000 and set up the "*Master Plan for Public Knowledge Information Resources Management*" which facilitates building and expanding databases and constructing electronic distribution system of such resources. The strategic areas of knowledge information resources are: science and technology, education and academic research, culture, and social welfare and industry data. The digitisation and construction of databases started in 2000. By the end of 2004, 210 million items were digitised. For the project phase from 2000 to 2004, about USD 160 million were invested.

Source: Presentation by Korea to the WPIE Workshop on Digital Broadband Content, December 2004.

Previous discussions have focused upon the effect of access regimes on the growth of PSI-based industries; but questions about the total welfare effects from different regimes also arise. The question that arises under various approaches is which model serves citizens, industry and overall welfare better? To develop competitive PSI markets, most OECD countries have attempted to ensure private service providers face the same conditions as public institutions, enabled private sector access to public data and clarified conditions under which these data can be used. For example portals have been developed that provide an overview of available PSI and conditions for use. Important questions are: which access regimes and re-use arrangements maximise the positive economic and other benefits of PSI, and which may for example develop commercial activities based on government-created content/data.

On the one hand, there are access regimes in OECD countries where commercial re-users have cheap and readily available access to PSI. They then add value to the public data and re-sell it to firms and

consumers. Some studies argue that such open access regimes improve competitive market conditions for PSI re-use, stimulate economic growth and create jobs. However there are also arguments that commercial re-users may have low-cost access to data which was costly to create for the government, and that taxpayers may pay twice for the PSI content (one time for creation of government content, and the second time when purchasing the content from a commercial re-user, although provided re-use is non-exclusive, users can also go to the original source for the original information, presumably at lower cost, but without value-added services).

On the other hand, there are access regimes where the public sector holds public sector information for its own use or employs cost-recovery strategies that allow only limited and potentially expensive access. In this scenario there are arguments that potential consumers of this data may have only restricted access to it, and that this approach is more costly to the consumer and for the taxpayer. Moreover, the potential economic gains from development of new commercial activities based on PSI re-use may be foregone. The economic and equity arguments surrounding commercial re-use of public sector information and content are complex and deserve considerably more analysis and policy attention.

Value-adding services and business models

Private companies usually add some value to public information before selling it. Business revenue models are generally based on individual use charges, subscription fees, advertising revenues, or on a combination of these. For instance, simple Web-based information services often allow free access to products and earn main income from advertising revenues.

Publishing models: This business model is based on some degree of information aggregation and transformation. For instance, database publishers integrate different sets of data while paying attention to different standards and formats and validating content integrity. With the development of ICTs the sustainability of this business model depends on the level of editorial work undertaken.

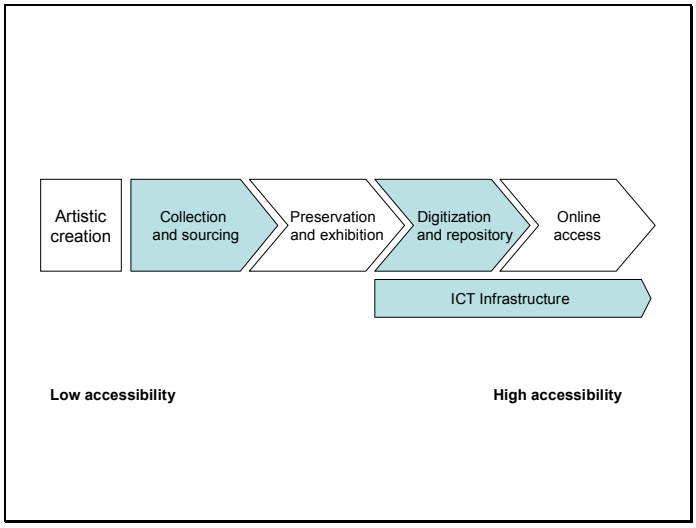
Applications models: These are based on application-driven innovative products and services such as, *e.g.* weather risk management which makes use of meteorological data to draw conclusions for specific industries (*e.g.* transport, insurance, farming etc.). They are usually value adding services and products which are made possible by a combination of new technological possibilities, and access to PSI for commercial exploitation.

Increasing access to Public Sector Content

As significant heterogeneities exist in the "value" chains of different types of public sector content, the analysis will focus upon cultural public content. The value chain exhibits two major differences with respect to the PSI value chain depicted above. Whereas in the case of PSI value is added to the original information, here benefits arise from providing access to content for current and future generations. Moreover, previously public bodies were information producers; in this case they (notably museums, libraries and archives) "store", "manage" and provide access to content which was originally created by a diversity of artists and authors.

Main elements to increase access to public cultural content are illustrated in Figure 4. From the public body's point of view, the first function is sourcing and collecting artistic or cultural material. This is followed by the preservation of the original artistic creation and its exhibition. The availability of ICTs has affected both tasks and has added further elements. Among the new tasks are: *i)* production of digital copies of the physical artwork and their inclusion in electronic databases, and *ii)* provision of cultural/social content on the Internet and in digital form to increase availability.

Figure 4. Elements of making available public cultural content



New technological possibilities for content diffusion and communication allow improving not only how widely cultural information is spread, but also the very quality of cultural and educational experiences. Main benefits of using ICTs for cultural and educational programmes content[3] are:

- To widen its diffusion.
- To capture stronger interest.
- To preserve it in collective memory and for future generations.
- To improve cultural/educational experience.
- To face challenges of education better (notably continuing, personalized and more attractive education).

Further detail on these aspects is provided in the discussion on purposes and projects of digital public content diffusion.

COMMERCIAL RE-USE OF PUBLIC SECTOR INFORMATION

Economic use of Public Sector Information

The public sector is a significant producer of information in all OECD countries. It is the single biggest producer of information in Europe.[4] It is also estimated that a substantial fraction of the US federal budget is spent on producing public information (UNESCO, 2004). OECD countries have increasingly recognised that PSI constitutes an important asset with considerable socio-economic potential. PSI is an important building block for the "knowledge economy". Further, with the development of the market for next-generational Internet and mobile services, economic benefits of public information will grow further.[5]

Table 2 lists some examples of products based on PSI; many of them are based on the combination of different pieces of information. A more detailed description of PSI products and services will be provided in the sector analyses below.

Table 2. Examples of products based on PSI

Products based primarily on one information type	Products combining various information types
Company profiles including financial analysis	"Intelligent" navigation systems helping to avoid traffic jams and to increase safety
Enhanced legal text databases for research	Geo-marketing (*e.g.* combining geographic with demographic data)
In-car navigation systems	Property evaluation (*e.g.* combining notary and geographic information)
Personal navigation (*e.g.* PDAs, mobile phones)	Location-based information on events, hotels, restaurants to handheld device
Digital online maps	Location-based information on doctors and pharmacies etc.
Geographic Information Systems (*e.g.* for network planning)	Location based services at big events/sites for orientation
Weather risk management (*e.g.* protection of crops)	Location-based tourist recommendations taking into account weather situation
Weather forecasts for different platforms (*e.g.* mobile phones)	Freight and transport management (*e.g.* combining geographic with weather data)

There are two ways in which PSI provides economic value. First of all, PSI is *i)* directly commercially exploitable as "raw material" for value-added products and services; and, secondly, *ii)* it has an element of "indirect economic potential" as inputs into economic activities to improve efficient decision-taking and production. For example, the analyses of demographic changes over time can be critical to businesses to enable them to identify emerging markets or to target customers.[6] The benefits of PSI do not merely arise for private companies, but also public bodies may re-use information to add value to their own products. In fact, governments and ministries are the most powerful users of PSI given the impacts of public decision-taking.

Quantitative estimates of the value of PSI

The economic value of PSI is difficult to estimate as a variety of economic actors make different use of PSI. Further, the importance of PSI differs across industries and for several re-use is merely a secondary or ancillary activity. Also, some of them are not readily identified in standard classifications. Consequently it is hard to identify the shares of production, value added and employment, which can be attributed to PSI. Hence, results of efforts at quantification should be seen as providing tentative estimates rather than authoritative data.

One attempt at quantification estimated the value of PSI (including cultural content) at EUR 68 million for the EU in 2000, approximately 1% of GDP (Pira, 2000). The methodology used is presented in Box 2. A value of EUR 750 billion was estimated for whole information sector in the US, despite the fact that it contains many activities that are unrelated to PSI. These estimates are not directly comparable but it was concluded that the US PSI market was considerably larger than that in the EU (see also Box 2), and given the rapid growth of commercial PSI re-use, the economic value of public information resources has probably increased both absolutely and relatively since 2000.

Box 2. PIRA economic valuation methodology for Europe

The PIRA study provided extensive estimates of the economic value of PSI, but some difficulties arise as the methodology is not always straightforward. Furthermore, the study's structural design is conservative, so estimates are most likely below the actual economic value.

PIRA identified two main estimates of the value of PSI: *i)* investment value and *ii)* economic value.

Investment value: what governments invest in the acquisition of PSI. In the PIRA study, the costs of acquiring the information gathered by the public sector provides a lower bound to the value of PSI

Economic value: the part of national income attributable to industries and activities which are based on the exploitation of PSI (*i.e.* value added of PSI with respect to the economy as a whole and private sector expenditure on PSI).

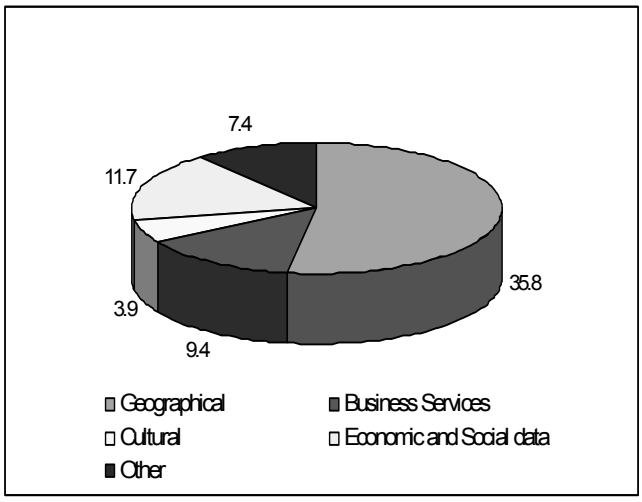
In the absence of data on the value of PSI, PIRA used a combined estimate with *i)* data on the investment value of PSI, *ii)* estimates of the value added by PSI users and iii) private sector expenditure on PSI. Identification and combination of information on these items is difficult, the result has to be treated with caution the more so for four additional potential sources of potential error:

- Estimating the value of PSI that is given away freely.
- The allocation of government agency receipts to intermediate and final users.
- The value-added estimate used to transform the value of information supplied to intermediate users into a final user figure.
- Using the relative size of national economies to extrapolate the value of PSI to countries not directly estimated in the research (in the PIRA study of the EU-15, five EU countries were estimated – Sweden, Portugal, France, the United Kingdom and Germany - directly and ten were extrapolated).

Source: PIRA (2000) and OECD.

The taxonomy of public information and content of Table 1 (above) illustrates the variety of domains, the most important domains for PSI are geographic information, along with business, economic and social data (BMWA, 2003). Figure 5 provides estimates of their economic value in the EU in 1999. Also, meteorological and legal system information, and to a lower extent traffic information are valuable. Cultural and educational content are also important resources even though the benefits from commercial exploitation are generally not of prime importance.

Figure 5. Estimated economic value of PSI in the EU per domain 1999
EUR billion



Source: Pira (2000), Sector analysis of PSI.

Geographic information

Geographic or geospatial information includes basic geospatial data and information on locations, which may be obtained through remote sensing, mapping, and surveying technologies. Most of the information is generally collected by ordnance surveying offices and public mapping agencies; and it covers approximately 80% of all information held by public institutions (European Commission, 2004).

Significant value-added lies in integrating basic geospatial data with factual data about the object or area being referenced. An example is combining geographic co-ordinates with demographic or market data. Because of these benefits of combination, over time the share of basic geospatial data as a proportion of the overall market has decreased. This is most notable in the geo-marketing sector where basic geospatial data only makes up for a fraction of the final product's value.

As for its economic importance, Pira International estimated the value of public geographic information to be EUR 35.8 billion in the EU in 2000. A survey on the economic value of the UK's Ordnance Survey (OS) maps for the UK economy estimated it to be between EUR 130 and 211 billion in 1999; this corresponds to approximately 10% to 15% of annual GDP (Ordnance Survey, 1999).[7] The fact that the UK figures are much larger than similar estimates for the EU demonstrate the complexity of assessing the commercial value of public sector information.

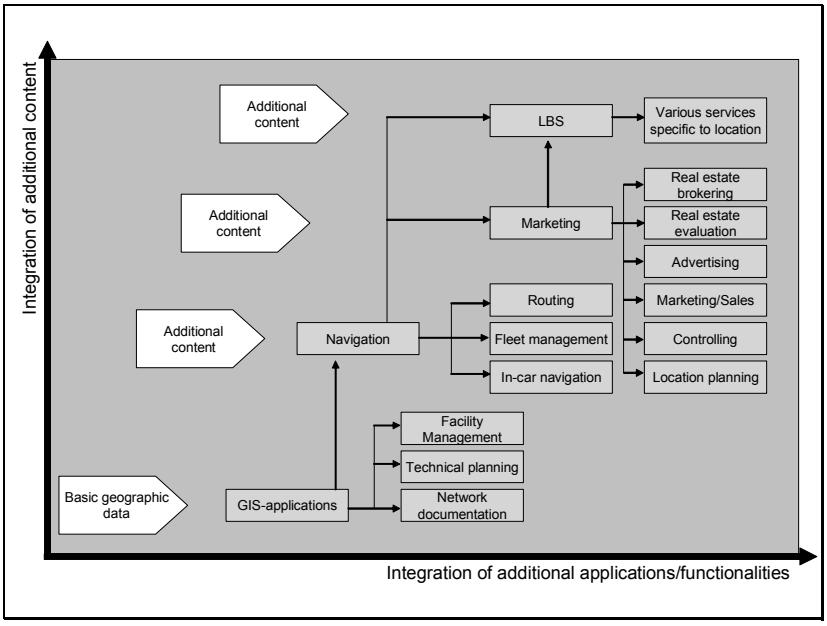
Most specialists agree that the growth potential of the geographic information markets is high. A German study develops scenarios based on different geospatial information market innovations, and estimates that employment numbers may rise from currently 16 000 - 19 000 to 29 000 by 2008. The exact values depend upon the scenario. In the case where all localisable public information is provided with a spatial reference; the report predicts additional employment growth effects (BMWA, 2003).

Main applications of geospatial information

Geospatial information has the broadest set of applications with four main markets for solutions and applications based on geospatial data. These are: *i)* Geographic Information System (GIS) applications, *ii)* navigation, *iii)* geo-marketing and *iv)* location based services, and each of these broad solutions

subsumes a set of applications which are used across almost all industry sectors, these are illustrated in Figure 6 (BMWA, 2003; State Chancellery of North Rhine Westphalia, 2001).

Figure 6. Geospatial data applications and their characteristics



Source: Micus Management Consulting GmbH, 2003).

Geographic Information System applications

GIS applications constitute the most important market segment; they are computerised data management systems capable of assembling, storing, manipulating, and displaying geographically-referenced information. GIS products are used in many industries for purposes such as utility and facility management, land-use planning, fleet management and logistics, and environmental management analysis. The databases also form the core of many PC applications and Internet-based services. For instance, GIS applications are predominantly used in the planning and documentation of buildings, networks and systems and for space-related analysis. Established applications are used by technology-oriented customers such as public utilities, transport and telecommunication companies. Mobile operators have made use of GIS in the roll out of the 3G (UMTS) infrastructure. Also Facility Management is an application that involves parts of GIS-applications. These are used to render the maintenance of technical equipment in various buildings and sites more efficient as defects can be localised (and visualised). Future developments include three dimensional solutions and also mobile and Web-based applications.

Navigation

The most common applications in the navigation submarket are in-car-navigation, telematics, routing and fleet management as well as logistics applications. Fleet management allows forwarding agencies and other companies which offer logistics services to use their resources (*e.g.* trucks) more efficiently. Fleet-management systems are a widely used application, but also vehicle navigation systems are well established. Further, various routing services which give users such information as the fastest way to an envisaged destination are offered on line; also various companies offer them on their Web sites to make finding the companies' premises more convenient.

Geo-marketing

The geo-marketing sub-sector includes using geographical applications in the areas of marketing, sales management, controlling and location analysis. Geo-marketing is frequently used for sales strategies (as *e.g.* direct marketing) and mapping-applications combine consumer, industry sector and other statistical data with a digital map. These allow locating potential customers more easily. Other applications include real estate evaluation and brokerage applications. These are used by notaries, lawyers, tax consultants, architects and building contractors. A further application is micro-marketing which requires increasingly detailed basic maps that indicate house numbers and storeys. This can present challenges for data providers. Also, there are potentially emerging privacy issues which need to be taken into account as these applications develop.

Location-based services

Location-based services (LBS) are a fairly new application of geospatial data (see Box 3 for the Tele Atlas case study of geographic databases). As yet highly important products have not been identified. After initial identification of the user's location (via mobile phone or computer), LBS provide them with local information such as tourist sites and events. Other LBS include location-based billing; these are mainly used by mobile operators and emergency services. With third generation (3G) network deployment and e-commerce compatible hand-held devices, these applications have an enormous growth potential.

Box 3. Case study: Tele Atlas, Belgium

Tele Atlas was founded in 1984 and specialises in the development, production and sale of geographic databases. The company has over 1 000 employees and disposes of comprehensive, uniform digital geographic databases covering Europe (437 million inhabitants in 21 countries) and North America (313 million inhabitants in the United States and Canada) and parts of Asia. These databases are to a large extent based on public geographic data sourced from over 15 major public cartographic bureaus or mapping agencies including institutions in the UK, Sweden, Austria, France, Switzerland, Germany and Belgium. In most countries, various information sources on national, state and municipal levels have been used. For example, in the US data is compiled from a wide range of partners such as state and local GIS departments, departments of transportation, and the US Postal Service also in order to rapidly detect possible changes. In order to cover as many areas as possible in the best and most accurate way, Tele Atlas also collects a lot of geographic data by means of field survey techniques such as mobile mapping.

Licensing agreements differ by institution and may be more complex depending on the type of information. In particular to attribute data such as house number information and street names often requires additional contractual agreements with additional public bodies (besides the mapping agencies).

Tele Atlas' three main products are databases tailored for use in *i)* In-Car- and *ii)* Personal Navigation applications, and *iii)* Geographic Information Systems (GIS). All products depend to the same degree on PSI as they are based on one central database which is updated four times a year. Total cost of source material amounted to EUR 4.1 million in 2004, of which about 40% related to PSI. Corresponding sales revenues were of EUR 127.7 million split equally among the three products. Among the company's main customers are system software providers which offer solutions to consumer electronics manufacturers and suppliers of navigations systems for the automotive industry. Cost of PSI is 1-2% of revenues; this indicates the high value-added produced by Tele Atlas. The main contribution is data enrichment which includes the integration of isolated information giving it a spatial reference. Data is aggregated in two ways: *i)* consolidation of international data on more than 20 countries in three continents into one single database and *ii)* combination of basic geographic information (e.g. location of streets and administrative boundaries, etc.) with other additional information (*e.g.* traffic direction, location of hotels and petrol stations).

One challenge Tele Atlas faces is in co-operating with public bodies to provide content for in-vehicle safety applications such as "advanced driver's assistance" (*e.g.* speed limit assistance, lane keeping support, curve warning). These safety systems rely on information on legal speed limits, traffic signs, numbers of lanes, accidents, existence of traffic lights, bicycle and pedestrian crossings. High quality of data (*e.g.* correct and timely) is crucial in safety applications and meeting this challenge depends on factors such as public data availability in digital form, consistency in collection and quality assurance, and readiness to share this information.

Source: OECD based on company interviews.

Geospatial technology industry

On the basis of ICT capabilities, a new geographical information industry has developed. It can be defined as "[…] an information technology field of practice that acquires, manages, interprets, integrates, displays, analyses, or otherwise uses data focusing on the geographic, temporal, and spatial context." (US Department of Labor, 2004). The geospatial technology industry supplies primarily *i)* public and private geographic information producers and *ii)* businesses which re-use public sector geographic information. Products provide tools for data generation and analysis (*e.g.* remote sensing technologies).

The worldwide market for geospatial technologies was estimated to be worth USD 5 billion in 2001. The same study predicted an increase to USD 30 billion by 2005 (US Department of Labor, 2004). The largest share, USD 21 billion, was expected to accrue to the United States. Growth is also expected to translate into future sector employment growth. The architecture and engineering occupations group which includes surveyors, cartographers and surveying technicians is expected to have the fastest growth between 2002 and 2012. The study also predicts employment in various other occupations will increase, Table 3 gives an overview. A major explanation for these positive estimates is the expected growth of Global Positioning System (GPS) technologies/applications. Also, the liberal approach of the US government for PSI access may explain part of the high estimate for the United States.

Table 3. Projected growth of some geospatial technology related occupations in the US

Occupation	Number Employed 2002 (000's)	Number Employed 2012 (000's)	Numeric Change (000's)	Change %
Environmental engineers	47	65	18	38.2%
Environmental engineering technicians	19	24	5	28.4%
Surveying and mapping technicians	60	74	14	23.1%
Cartographers and photogrammetrists	9	10	1	15.1%
Geoscientists, except hydrologists and geographers	28	31	3	11.5%
All other drafters, engineering, and mapping technicians	150	167	17	11.3%

Source: US Department of Labor (2004).

Developing a spatial data infrastructure

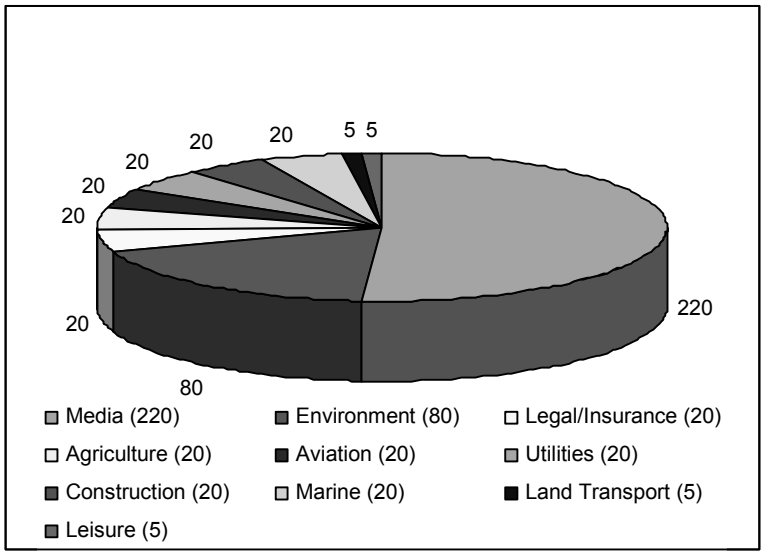
Developing a geospatial market requires an efficient Spatial Data Infrastructure (SDI). This means technology, policies, standards, and human resources have to enable the acquisition, processing, storage and distribution of geospatial data. Many countries have initiated programmes to establish such a national infrastructure, but strategies and especially the role of private and public institutions differ. For example, the Japanese geospatial information market is largely deregulated and initiatives emerge mainly from the private sector. The United States has also extensively included the private sector. In contrast, in the United Kingdom the government has taken a leading role in various areas. In Switzerland the debate centres on the extent of public sector data provision rather than on whether and how private suppliers should be involved (BMWA, 2003). A proposal for a directive creating a European spatial data infrastructure is being discussed in the European Council and European Parliament (INSPIRE proposal).[8]

Meteorological and environmental information

Meteorological and environmental information has recently been used more extensively for commercial purposes (see case study of weather application in Box 4). Issues such as the assessment of access to environmental information and environmental reporting by governments have been addressed by the "OECD Recommendation on Environmental Information" in 1998.[9]

National Meteorological Services (NMS) produce the majority of meteorological data; and their public service responsibilities also include duties such as supporting defence, provision for safe shipping, severe weather warnings and services to civil aviation operations. Historically, in Europe weather services have been provided at little or no charge to the general public, and diffused through national broadcasting services. In Europe, governments have increasingly put pressure on NMS to charge for forecasts and related commercial activities. In the United States, however, weather reports from NMS are generally freely available for commercial re-use.

Figure 7. US Market for private weather services in 1999
USD million



Source: Weiss (2002).

In the United States a considerable private weather services market has developed. It provides services to the media industry and was worth USD 430 million in 1999 (Figure 7). As budgetary pressure has had an impact on services provided by NMS, the European private weather industry has also experienced substantial growth, particularly for detailed forecasts and other value added services. Increased quality and accuracy of weather data make forecasts extremely marketable products to weather-sensitive businesses.[10]

Relationship between National Meteorological Services and the private weather industry

Specifically in Europe, the roles of public and private weather institutions are not clearly defined and competition between them arises in some markets. In Europe, some of these issues have been addressed by the Economic Interest Grouping of the National Meteorological Services (ECOMET). This group has also put into place regulations which define the basis for competition between the private and public weather industry, and for competition between NMS's.[11] It has also attempted to establish a common tariff structure for weather information across Europe.

The World Metrological Organization (WMO) has addressed the relationship between private and public weather services at the global level. Competition was included as one of the major objectives of action from 1996 to 2005 (WMO, 2005). The organisation aims to: "Build an effective harmonious and mutually supportive relationship between the public and private sectors of the meteorological and hydrological communities in the provision of commercial meteorological and hydrological services."

The Association of Private Meteorological Services (PRIMET), which groups 32 private companies offering weather services in Europe, has emphasised the limited liberalisation of the European market and anti-competitive behaviour of incumbents. A large number of companies provide private weather services, but many are very small and operate mostly in specialised market segments. The association claims that most private companies have not been able to grow because they face high costs to obtain basic data and non-competitive market conditions. The following specific observations were made by the private sector:

- In many countries there have been only limited attempts to separate public and private activities; resulting in cross-subsidisation to public providers.

- The exercise of control over key intergovernmental agencies (*e.g.* ECOMET, WMO) is such as to benefit the NMS but not private sector companies.

- Discriminatory pricing for purchasing public sector content exists[12], prices are often based on such features as the purchasing company's turnover.

- The provision of value added weather services to private industry (such as offshore oil and gas, highway authorities and retail) by NMS's at prices which do not reflect their cost of production taking into account all applicable overheads.

- Private services are prevented for accessing certain markets, especially aviation, through single supplier agreements between the NMS and other government bodies.

In the United States the relationship between the government and private companies has been clarified. The NMS produces meteorological data that is made freely available (including satellite and radar information). Its scope of activities embraces also general forecasts and warnings. Academic institutions conduct research to advance this science. These activities are separated from those of private companies which focus on commercial meteorology and weather risk management (National Research Council 2003).

Estimated industry sizes in Europe and the United States

The weather risk management industry was estimated to have a North American contract value of USD 9.6 billion from March 1997 to March 2002 (Weather Risk Management Association, 2002). The European total was USD 721 million during the same period. Other estimates for the private weather industry are lower, but they also reflect major differences between the United States and Europe. This is largely due to the fact that in Europe many meteorological services are provided by public NMS.

The United States is also the most important source for private weather industries in many countries. In fact, many European private weather companies obtain numerical weather prediction data and atmospheric model data from the United States and not from their own NHS. This is so because in Europe the costs to obtain numerical weather predication and atmospheric model data are higher. Global observation data are also sourced in the United States through NOAA (National Oceanic and Atmospheric Administration). Even though in the United States this data is potentially available at marginal cost, protective restrictions are placed on the packaging and re-sale of certain types of data for certain countries under resolutions drawn up by the World Meteorological Organisation (WMO).

Main applications of meteorological data

Weather is a critical element to many industries and, as a consequence, there are many application areas for meteorological data. These include travel, transport, disaster prevention and weather predictions for media and agricultural industries. For instance, weather risk information is used in passenger and cargo transportation, fire-fighting, disaster prevention, crop dusting, and aerial photography. Meteorological data is also used to increase safety and efficiency of sea- and coastal-based work projects. For instance, weather and hydrographical information facilitate, marine construction, oil drilling, cable- and pipe-laying. For disaster prevention, it is crucial that accurate and timely weather analysis be provided to public agencies, organisations or corporate entities involved in disaster prevention and relief.

Weather remains a critical element to the aviation and transport industries. This information is not only necessary to optimise operational efficiencies but also to improve safety. On an operational level the information is used for the creation of flight plans, pilot briefings, and even en-route weather updates. Weather based data are also used to provide voyage planning and efficient fleet management services for international shipping. Weather routing services use short and long range forecasts for planning transoceanic voyages, a powerful application in combination with satellite positioning technology. Meteorological information is also used in the area of land transport for road management and railway management.

The media are a principal demander of weather information (*e.g.* TV broadcasting, the Internet). Also, mobile weather services are increasingly provided to various end-users (as consumers, industries, etc.) These offer weather information over the latest wireless technologies; sometimes they afford a high degree of customisation to satisfy differing demands.

The value that private weather services add to public sector data varies and greatly depends on customer demands. Whereas products for the media industry require substantial graphical presentation, other corporate customers may request complex databases as well as user-friendly interfaces.

Box 4. Case study: Weathernews Inc., Japan/United Kingdom

Weathernews Inc. is a global company with 38 offices in 14 countries situated in Asia, Europe and the Americas. Headquartered in Tokyo, Weathernews provides weather-based services to customers in a growing variety of sectors including aviation, shipping, offshore oil and gas, road, rail and new media services such as mobile, Internet and digital TV. The company has over 700 employees and annual global revenue exceeds USD 100 million.

For the provision of its services Weathernews depends on access to public meteorological data. Main data sources are NMS and supranational organisations such as ECOMET (a European organisation of NMS). Products include forecasts and services that are applied to risk communication services and operational decision support and help taking direct actions to mitigate potential weather risk.

Weathernews adds value to public meteorological data primarily by data aggregation, innovative processing, modelling of raw data and use of latest technology to package and deliver services to clients. Moreover, risk communication services provide industry-specific interpretation of forecasts.

In Japan, Weathernews regularly competes with the Japanese National Meteorological Service (JMA) to provide weather services to retail, leisure, rail and aviation industries; in several cases the company has been successful and supplanted JMA. In the United States where the private weather industry is a significant and thriving part of the economy, Weathernews does not face public sector competition, but many other private weather companies which offer similar services exist. In Europe the company's market share is relatively low; penetration is difficult because of the dominant position of National Meteorological Services.

Source: OECD based on company interviews.

Economic and business information

Information sources and related issues

Economic and business information is, together with other statistical information and some legal system information, of specific interest to database publishers (case study in Box 5). This type of data is usually generated by separate public bodies. Usually statistical data is produced by the national statistical offices whereas corporate business data is compiled by the public body administering the register of companies.

With respect to business information, there are significant differences between countries as to which and how related data are collected and administered. Setting up a company, for instance, generally requires some kind of registration with a public body (*e.g.* regional Chambers of Commerce in Germany and Italy). The information provided upon registration constitutes a statutory document which contains various sorts of data. This usually includes information on the firm's legal status, date of establishment, company capital, VAT number, a list of main activities, legal representatives, the number of employees and business location. If a company is publicly listed on a stock exchange, the information requirements go far beyond these. Exact requirements and responsible public institutions differ by country. In the case of the United States, the annual 10 K reports required by the US Securities and Exchange Commission (SEC) demand that all listed companies file registration statements and periodic reports through the web portal EDGAR (www.sec.gov/edgar.shtml). The Web site can be freely accessed by everyone to download corporate information.

As for *ad-hoc* company news and announcements provided by listed companies, until recently public stock exchanges have had the public mandate to disclose these sorts of information. But in several countries this is no longer the case as this information market has been liberalised. For example, in the United Kingdom the London Stock Exchange was the sole provider of regulatory corporate news until April 2002 when the Financial Services Authority opened up the market for provision of regulatory news. As a result about nine private companies have emerged. These have played an important role in improving services. For instance, they introduced substantially improved Web-based services. Whereas basic information is freely available to the public, enhanced higher-value services are provided to customers (Skeete, 2004). This liberalisation trend can be observed in many countries, but there are also some equity markets as *e.g.* Australia which has retained their monopoly position.

Whereas companies such as Reuters primarily use these company announcements, others such as Dun & Bradstreet (D&B), use corporate information (including financial statements) which is to a large extent collected by public bodies. D&B provides information on a businesses' financial standing on the basis of a commercial database that includes 92 million companies. Business data is gathered from the companies' registration authorities. These are located in over 200 countries. D&B adds value to PSI by aggregating and ensuring that data are up-to-date, accurate, complete and consistent. D&B also produces evaluations of a firm's past performance and performance forecasts. D&B licenses registered data and balance sheets for highly varying prices and under different terms and conditions. This reflects differences in national cultures and attitudes regarding cost recovery, control of data accuracy and privacy protection (Pira International, 2000, D&B Web site).

Statistical information is another significant area of PSI. Access conditions vary widely across OECD countries. However, Eurostat, the statistical office of the European Community, recently took a step towards granting liberal access to statistical data in Europe. Since October 2004 the organisation has made its databases freely available to the general public.[13] Data may be reproduced provided the source is acknowledged and conditions specified in the general copyright notice are fulfilled. Commercial

redistribution is also permitted, but is still subject to the conclusion of a licence agreement with the Publications Office.

This step may encourage the further development of value adding activities on the basis of Eurostat data. The US experience suggests that liberalised access to public information can foster growth of database publishers. PSI such as corporate data from the Securities and Exchange Commission but also data from other domains such as patent data from the Patent and Trademark Office have contributed to the significant growth of the information retrieval and database industries. The industry grew from USD 4 billion in 1994 to an estimated USD 10 billion by 2002. In the period between 1991 and 1999 data base vendors almost tripled from 900 to 2 400 (Weiss, 2002). However, it is also the case that the use of ICTs renders publishing activities with little added value redundant. Further, the wider availability of high quality statistical data may undercut simple commercial redistribution with no or little value added.

Box 5. Case study: Euromonitor International PLC, United Kingdom

Euromonitor PLC is a provider of consumer market intelligence and conducts research on international markets. The company is operating on a global scale with offices in London, Chicago, Singapore and Shanghai. It has 270 employees. Main clients include manufacturers, retailers and suppliers of consumer goods, international investment banks, management consultancies, advertising agencies and educational institutions. It derives revenues from a variety of products and services that include online databases, market reports, statistical handbooks and consultancy services. As opposed to market analysis (*e.g.* market reports), business reference products are mostly based on the re-use of PSI.

Business reference products include statistical handbooks and databases as well as hardcopy directories. Whereas the directories are simply compilation products with lists of names, addresses and activities of business and public institutions, the production of statistical handbooks and databases requires PSI sourcing. These generate EUR 6 million in annual revenue and account for 75% of the total business reference revenues products and for 20% of Euromonitor's overall revenues.

The products require information inputs from numerous mainly public institutions (such as national statistical offices, Eurostat, OECD), these include primarily international social and economic statistics. Altogether, data is sourced from over 1 750 public bodies in more than 200 countries.

Depending on country and institution, access to and cost of information diverge as in some cases public information has to be sourced by the means of licences and in others not. Typically insubstantial amounts of data can be obtained from published or online official publications for the cost of purchasing or accessing the source publication. Larger amounts of data and those that need to be compiled from underlying datasets often need to be negotiated to agree upon costs and re-use licences.

Euromonitor is adding value to public information by identifying all relevant sources of statistical information and by aggregating and producing comparative data on the basis of heterogeneous basic statistics. The company underlines that apart from technical skills for data reconciliation the real added value is based on their analytical experience and business understanding. This allows data estimation, forecasting and remodelling together with "reality-checks" to produce high quality data.

Total cost of PSI sourced for business reference products amounts to less than 1% of revenues per year, and editorial and analytical costs, a measure of value added activities, represent 32% of revenues. The added value also depends on the type of statistical data as some data require more reconciliation and editorial work (*e.g.* re-mapping to a common classification) than others.

With increasing international standardisation of statistics the company's importance in this area is weakened. But Euromonitor's business model is in part based on continually adding more value and more specifics. However, growing international standardisation is a challenge for database publishers whose business models are based on these activities.

Source: OECD based on company interviews.

Traffic and transport information

Traffic and transport information is a fairly narrow domain. It includes data on roadwork, road usage, car registration and traffic congestion as well as statistics on railway, air and maritime transport.

Whereas transport statistics are produced by national statistical offices, car registration data originates from a separate public body (usually a local or regional registration authority). But it is the information generated by the departments or ministries of transportation (such as information on roadwork, traffic congestion and road usage) that has the greatest potential for commercial exploitation. Most important applications of traffic data are "intelligent" navigation systems (see also applications of geographic information). Recent traffic data on traffic congestion may be integrated in routing systems in order to circumvent travel delays. Knowing which roads and streets are frequented at what times and at what intensity may also be used to optimise advertising. Box 6 analyses the business case of Traffic.com Inc, a provider of traffic data and related services.

Box 6. Case study: Traffic.com Inc., United States

Traffic.com, Inc. is the leading independent provider of traffic data, content, and services to broadcast media, businesses, and consumers. With proprietary data collection and processing technologies integrating public traffic data, the company delivers innovative and highly differentiated information products to independent radio groups and TV stations.

In addition to providing traffic information to broadcast media, Traffic.com provides real-time content to consumers via Web, mobile, and desktop applications. The company co-operates with radio, TV, telecommunications, Web, satellite radio, and in-vehicle navigation companies. In partnership with the US Department of Transportation (USDOT) and state agencies, Traffic.com has deployed, and is expanding, a proprietary sensor network and data collection infrastructure in major markets. This allows for digital traffic information such as average speeds, travel times and traffic congestion in real-time accuracy.

The "Traffic Pulse data fusion engine" integrates available USDOT and other public sector data to provide travellers and businesses with information services. These resources are the basis for applications such as TV traffic broadcasts enhanced by 2D or 3D graphics, radio traffic reports, Web sites, XM Satellite Radio Instant Traffic & Weather reports and "Traffic Pulse Voice", an automated speech recognition application that enables users to obtain personalised real-time traffic updates via phone and selected in-vehicle applications. The latter especially (*e.g* intelligent car navigation systems) bear significant potential for growth. As laid out in the section on geographic information, this example demonstrates again how additional value can be created by the combination of different PSI.

Traffic.com value creation centres on the comprehensive, timely and reliable provision of high quality traffic data. This requires covering road networks as widely as possible. Thus the company generates its own data in areas where public bodies do not and combines these with the available PSI. Moreover the company ensures information is up-to-date by maintaining the sensors on a regular basis and using latest technology to transmit the data.

Source: OECD based on company information.

Legal system information and content

Legal system content includes laws, information on legislation, on rights and duties and on judicial decisions. Further, it provides crime and conviction data and also patent and trademark information. Most content is produced by state or federal courts; patent offices and statistical institutions.

There are no estimates of the economic value of legal information. Nevertheless, it is apparent that legal system information constitutes an important input for businesses, especially for database publishers. Companies such as LexisNexis (part of Reed Elsevier), Wolters Kluwer and Thomson Legal & Regulatory operate globally. In most OECD countries they offer products and services which are largely based on public legal information.

Wolters Kluwer has two divisions which provide enhanced legal information products and services, these generated USD 2.35 billion in revenues in 2004.[14] The corresponding figure of Thomson Legal & Regulatory was USD 3.4 billion.[15] LexisNexis' 2004 revenues were EUR 1.9 billion.[16] This adds up to USD 8.4 billion, which gives an indication of the economic value of re-use activities based on legal public records. However, the actual value of these firms' PSI value-added activities is lower as a portion of the revenues cited above stem from activities such as publishing legal books among other activities which do not re-use of PSI. But, there are many more legal publishers, especially small and medium-sized enterprises operating nationally.

Value creating activities on the basis of legal system content are not very diverse. The core business model is the provision of solutions tailored to specific information needs. Generally, these goods and services are produced by use of previously established databases which aggregate PSI such as case and statutory law as well as other judicial decisions or court opinions. Further value is added in that the databases are transformed so as to be able to search for and retrieve information. Other typical value-adding activities include editorial work which makes content more user friendly (*e.g.* head notes, classification systems, synopses and cross references are introduced).

Products are primarily used by law firms, legal departments of private corporations, courts and other institutions which deal with laws and litigation. Public users include government institutions, administrative and regulatory agencies as well as prosecutors, investigators, judges and other court staff. Academic institutions such as colleges, universities, law schools and secondary schools also make up for a considerable share of overall demand. It is striking that the public sector itself is not only the major source of most basic information but also one of the major purchasers of these products and services.

Challenges for PSI

Despite the possibilities offered by ICTs and large economic potential, opportunities of commercial PSI re-use have not always been seized. A variety of obstacles hamper the extensive commercial exploitation of PSI. Further, distinct challenges arise in the attempt to increase public content diffusion, also difficulties for digital content preservation arise. For the most part challenges of PSI exploitation relate to *i)* the definition of roles between the public and private sector, *ii)* operational management, iii) data quality issues and iv) lacking statistics.

Public body interface to re-users

Dialogue between the data-producing public body and private industry is necessary for commercial PSI re-use. Traditionally, PSI has been produced for internal use only. As a consequence, public institutions are often not used (or even reluctant) to allow access to content. Limited awareness of the potential economic value of PSI further inhibits the development of efficient dissemination methods. Moreover, insufficient public institution transparency concerning available information, activities, processing re-use licenses and pricing more generally may render use difficult. The situation is worse if information service firms want to operate at an international level (*e.g.* to provide global weather risk management) because national frameworks and access regimes differ. Frequently, pricing models, access rights, licence arrangements and other aspects are distinct. As a result, firms have to engage in cumbersome data collection activities to retrieve data.

Licensing agreements and transparency

Some public bodies use licensing arrangements to charge for commercial re-use and/or to impose conditions on its use. The latter often specify authorised forms of re-use and regional use restrictions; they may also restrict re-use significantly if formulations often lack clarity. A related challenge is that standard

licences are frequently unavailable, high transaction costs (given time-consuming costly individual negotiations) are the consequence. Small businesses in particular with limited resources might resist. This will be reinforced if data are fragmented and have to be collected for each region independently.

Data quality

The main limitations on data quality that exist to differing degrees in OECD countries are the following:

The lack of indices, directories and complete catalogues makes it difficult to know what PSI is available and where to find it.

Data is not available in digital form. But note that there has been significant progress in obtaining this in recent years.

Data are fragmented on regional, state and/or national level, this may render access difficult. For certain information, *e.g.* tourism, traffic and environmental data cross-border availability increases their usefulness to consumers.

Standards to ensure interoperability have not been established yet. This makes it difficult to combine information and functionality from different systems across different organisations, applications and platforms. Standards on metadata[17] descriptions also need to provide possibilities for simple computer processing.[18]

The Tele Atlas case study (see Case Study page 22) provides an example of interrelated challenges and policy issues that directly affect businesses and innovative applications. High quality data is important for safety applications as part of in-car navigation. Meeting this challenge depends on factors such as data availability in digital form, consistency in collection, quality assurance, and the readiness to share this information. For example, these demands on data were made in the final report of the EC "eSafety" initiative (European Commission, 2002).

Statistics

The Pira International study (2000) was a first comprehensive attempt to quantify the economic value of PSI. However, this needs to be followed up with further measurement and analyses of the potential economic gains from public sector knowledge and its digitisation to provide analytical support for regulatory changes and investments in digitisation and access to public information and content resources. It has also been suggested that empirical research on comparative economic gains from different access regimes is necessary to substantiate findings on the economic consequences of (un-)restricted access to public content (Burkert and Weiss, 2004).

INCREASING ACCESS TO PUBLIC SECTOR CONTENT

The use of digital public content

National public institutions have the mandate to provide access to and to preserve national cultural heritage. This task is motivated by various reasons; some of them are a result of expected socio-economic benefits of public content preservation/diffusion and how ICTs can help to realise these.

Equity and inclusion

Democratic societies are committed to make public cultural content available to everyone. This includes reaching out to socially and economically disadvantaged groups. Additionally, many public institutions also want to stimulate interest and use of cultural and educational resources. ICTs provide large opportunities to assist both aims. To quote the European Commission DigiCult (2002) study: "The conversion of all sorts of cultural contents into bits and bytes opens up a completely new dimension of reaching traditional and new audiences by providing access to cultural heritage resources in ways unimaginable a decade ago."

Moreover, culture is important for individual identity and social cohesion. An online environment facilitates interaction with and contribution to a cultural exhibition/manifestation and in particular, the Internet also offers a valuable means of expression for different cultural groups and minorities. Various digital culture initiatives seek to include this purpose in their policies. For instance, one of the central aims of the Canadian Culture Online Branch is to foster dialogue between communities and promote shared values and history (Annex 1, Table A1.2). An upcoming project of Culture Online illustrates the benefits of new technological possibilities for social inclusion. It seeks to inspire people from British immigrant communities to create personal websites which document the contribution of British immigrants to the country. To stimulate participation workshops and events will be organized. In a final step, the stories will be published online (Culture Online, 2005; Annex 1, Table A1.2).

Preserving experience

The Internet allows collecting a whole range of new and different material. Specifically, the decentralized nature of the Internet also provides a space for uncontrolled cultural expression, collection and publications. To give an example of a programme, World War II Remembered[19], a project of Culture Online (2005), encourages older people to interact with the British Broadcasting Corporation's (BBC) War initiative to collect their stories for a Web archive.

However, the Internet also poses challenges for efforts to preserve past cultural content. Although museums and libraries are widely used for access to information, the Internet has increasingly become the main source of information. Specifically younger generations rely more strongly upon new media. Considering these trends, the DigiCULT study (2002) concluded: "In the Information Society, in the long run, only the digital will survive in the memory of a nation as it is more readily available and accessible than analogue cultural heritage resources."

Life-long learning and education

The Internet allows a wider diffusion of educational content as it reaches beyond established educational institutions (*i.e.* schools, universities, etc.); information can be accessed in a convenient and cost-effective way via the personal computer at any chosen location and time. With the move towards the information society, many countries have recognised the importance of knowledge diffusion and life-long learning for economic competitiveness. The OECD's 1996 report "Lifelong Learning for All" emphasised the growing importance of creating learning societies where knowledge acquisition would also become an integral part of professional life (OECD, 1996). The diffusion of cultural and specifically educational content is important to provide opportunities for learning. This has been widely recognised; for instance, the EC's DigiCULT study recommended cultural heritage institutions keep a focus on educational purposes in their digitisation policies (EC, 2002a). Moreover, there are also possible qualitative improvements, notably possibilities for more personalized and more effective learning if new "e-tools" *e.g.* games and possibilities for online interaction with other learners are efficiently applied.[20] Furthermore, ICTs can contribute to improved educational content if it allows establishing a better connection between cultural sources, education and various other sources. Also, given the international features of the Internet, co-operation across countries can improve the amount of educational material available (as scale economies can be exploited).

Commercial and creative use

Cultural heritage represents a valuable stock of material that may also be re-used for commercial purposes. Its diffusion can help to create markets in that it creates new product demands by users and related firm activities to supply these new demands, and diffusion of cultural material can drive network traffic, development of specialised search engines for visual and audio content and new digitisation and archiving technologies. However, beyond commercial re-use of cultural content, new artistic creation itself benefits from the accessibility of existing content as sources of inspiration. Beyond economic or other social goals, cultural and national heritage are sources of enjoyment and (aesthetic, spiritual, historical, symbolic) value for the viewer. Specific examples include tools developed by the games industry which may be used for interactive cultural games capturing the attention and interest of children and new user groups (see OECD, 2005a). Users can increasingly personalise services/products and interact via participation in communities; they may also be able to contribute their own user content. More generally the Internet provides a basis for more detailed expression of individual cultural experiences and interests.

Improving access to public sector content

The public content considered here comprises mainly cultural material of museums, galleries, libraries, archives, archaeological sites and also various forms of educational content. To be able to benefit from ICTs, digitisation of art pieces such as paintings, artefacts and sculptures and of text, audio and film material is necessary. OECD countries have started to digitise extensively. In Korea initiatives to digitise and make accessible a broad range of public content are ongoing (see Box 1). Facilitating online access to cultural heritage is also a priority of the European Commission; it is mentioned in the Information Society Technologies (IST) priority area within the 6th Research Framework Programme (FP6, 2002-2006).[21] It is also one of the priorities in the new Audiovisual Australia Project, and is a major feature of the Government of Japan's programme to increase access to digital content across a wide range of government activities and cultural holdings.

Digitisation of European cultural heritage

The DigiCULT (2002) study described the situation of European cultural heritage in 2001 as one where holding institutions faced higher than expected costs for digitisation. The quality of digitisation was generally rather complex and not of high usability. As 90-95% of this funding was public and few business models existed, the low ranking in political priorities and the lack of focused digitisation policy programmes were significant drawbacks. Moreover cultural heritage institutions were not best prepared in terms of internal structures, business orientation and technical competencies.

According to the European Standards Map, in 2000 only 10% of public museums in France and Italy had digital images of their collections and only about 20 out of several hundred French museums were expected to provide interactive gallery systems by December 2001 (European Museums Information Institute, 2000). Further, a 2004 survey by the Czech Statistical Office revealed that online presentation systems were not widely used (Czech Statistical Office, 2004b). Out of all Czech museums only 5% featured online photo galleries and virtual exhibitions.

For 2006 the DigiCULT (2002) study projected possible improvements. Funding would still be mainly public (about 85-90%), but cultural content goods and services would be sold in some niche markets. The report was positive about government commitment to cultural heritage with respect to management focus, funding and legislative changes for cultural content (see EC, 2002a). In terms of content projects, new services were expected to be more individualised and interactive and potentially create "culture communities" (for more detail see EC, 2002a). To date, much of the potential for cross-border exchange of e-learning applications has not yet materialised (EC, 2005a).

Audiovisual Australia Project

The Digital Content Working Group of the National Broadband Strategy Implementation Group has scoped an *Audiovisual Australia Project* to address the need for a national framework to support the supply of high quality Australian content to broadband users. The framework will assist Australian cultural, educational and research organisations to provide full-screen and full-motion video content to emerging broadband networks. A model for an Audiovisual Australia has been developed based on the successful Picture Australia service. The objectives of *Audiovisual Australia* are to:

- Help stimulate domestic demand for high capacity broadband services by providing a diverse range of high quality Australian video content.
- Address the shortage of Australian video content that is available for broadband users in an environment dominated by international content.
- Assist Australian cultural, educational and research organisations to release and distribute suitable video content for their respective users over broadband networks, and
- Explore new ways of copyright management to facilitate easier access to relevant audiovisual content including where appropriate the application of Creative Commons licensing.

Japan's promotion of digital content archives

Promoting the establishment of archives for digital content is one of the main aims in the Government of Japan's "IT policy package 2005" to further enhance digital content archives of governmental ministries, agencies, etc. To ensure and expand access and to preserve content, for example the National Diet Library established the archives of government publication materials. By using the Library's Web page archive, long-term preservation of each government ministry's or agency's Web page is being attempted. The Government has also set up a liaison council among related ministries and agencies, to set

out rules for the establishment and publication of the archives, including archives on arts and cultural properties, governmental publication materials, laws and acts data, judicial precedents, statistics, geographical information, meteorological information, academic and research information, and library information (see Annex 1, Table A1.3).

Since April 2003 the Agency for Cultural Affairs and the Ministry of Internal Affairs and Communications have been working on the promotion of "Digital Archives on Cultural Heritage". This is intended to actively disclose information on the tangible and intangible cultural property of the nation and of local areas, through high speed large-volume communication and is aimed at establishing an online portal of cultural information, with approximately 1 000 museums taking part.

Educational content

Over recent years, increasing attention has been paid to e-learning. For instance, at an international level, one area of interest of the OECD Directorate for Education investigates efficient uses of ICT to improve the quality of teaching and learning. The following focuses more specifically on educational digital content, a series of institutions and digital education projects are listed in Annex 1, Table A1.1.

Projects focus upon different aspects of digital online content. A large number are concerned with providing access points that allow finding all available resources on the Net (*e.g.* Educational Network Australia, Gateway Fund, EDUNET, National Grid for Learning, MERLOT). E-Learning has also been a central focus of eEurope 2005, which was launched in June 2002. Others programmes seek to support the creation of high quality and interactive projects (*e.g.* Culture Online, National Gallery of Art, Washington D.C., E-Learning Program). Another concern is to stimulate user interest and participation *e.g.* by informing target groups about available resources (*e.g.* MarcoPolo, Culture Online). The institutions that conduct and/or fund these projects are often either non-profit institutions and consortia (*e.g.* MarcoPolo) or institution/departments linked in various different ways to educational ministries. Further actors are individual cultural institutions (*e.g.* National Gallery of Art, Washington, D.C.). There are some international networks, some of them have been recently created and may well become significant players in the future (*e.g.* MERLOT, GLOBE).

Cultural content

Various digital cultural heritage programmes have been initiated in OECD countries and different institutions have taken up the co-ordination of these activities. Annex 1, Table A1.2 provides summary information on a selection of these projects. Information on a number of European cultural heritage projects which were initiated from 1996 to 2001 is provided by the DigiCULT (2002).[22]

Cultural digitisation projects

Several projects were set up to increase online availability of cultural content, these include efforts to increase digital content of museums. An example of a very large-scale project is the Louvre's digitisation project (Box 7). Other programmes have sought to provide digital content in areas where until recently only little material was available on line. For instance, Arcnat provides information on archaeological sites. Public broadcasters hold large audiovisual archives most of which are not accessible to the public. Some OECD governments are currently exploring if and how to make these archives available on line, and some innovative access regimes are on trial. In autumn 2004, the BBC launched the "BBC Creative Archive" (BBC, 2004; Annex 1, Table A1.2).

Box 7. The Louvre

The Louvre is one of the world's most important museums with its broad collection of antiquities. At the end of 2003 the Louvre administered around 374 000 works of art in total (including items not exhibited). Of those over 83% were referenced in a database (50% with a digital image).

The Louvre's 2003 annual report states that "the number of visits to the Louvre website in 2003 (roughly six million) shows that the Internet has become increasingly indispensable to afford access to French cultural content in France and abroad." The museum's Web site (www.louvre.fr) is a multimedia portal giving various forms of access to cultural material and is financially supported by patrons. One option is online tours which use virtual reality movies to show the galleries themselves in 60 panoramic views. The second means provides structured access to some specific collections (approximately 600 images). A third possibility is to access the museum's database Atlas. Originally, the digitisation and creation of databases was a means of managing collections. However, the creation of the database Atlas was specifically aimed at increasing the amount of images available on line. It groups images and descriptions of approximately 30 000 exhibited works of art which represent 98% of total exhibited items. Furthermore, the Louvre also contributes descriptions and/or digital images to external thematic databases (*e.g.* Database Joconde) and gives free access to departmental databases upon request (*e.g.* Department of Prints and Drawings).

The Web site "louvre.edu" is the Louvre's educational virtual environment service. Louvre.edu is a commercial offer generating revenues by charging EUR 37 for an annual subscription. But there are special arrangements for institutions such as schools and libraries; it was established in conjunction with *Pagesjaunes Édition* and in partnership with the French Ministry of Education. The environment builds on the collections (digitised objects) and digital library resources of the Louvre. Users of this subscription-based service, which is primarily aimed at scholars are provided with a personal "virtual office". The virtual office has a set of functionalities with which digital objects (images and legends, texts and audio commentaries) can be selected, combined and re-grouped and stored together, or downloaded for external use as, for example, classroom presentations. Generally, the cost of content generation for online use is high, especially the costs associated with the development of well-supported, interactive educational material.

Commercial exploitation activities of the Louvre are outsourced to the public institution *Réunion des musées nationaux* (RMN) which is in charge of the commercial activities of 32 French museums. The products sold by the RMN include: books, images, videos, CD-ROMs and DVD-ROMs, moulds, engravings, and jewellery. Online image ordering for professional use is possible via a special Web site which includes over 200 000 photographs of art works.

Source: Louvre Annual Report 2003, Web sites of Louvre (www.louvre.fr), Digicult (www.digicult.info), *Réunion de musées nationaux* (http://www.rmn.fr)

Online library material and information

Many digitisation projects of library material are currently being undertaken in OECD countries. Major projects are, for instance, conducted by the French National Library (BnF), the US National Library of Congress (LC),[23] the National Library of Australia, the National Library of the Netherlands and the British Library. In most countries, free online access to digitised library material is still limited and often confined to thematic collections. But there have been important advances, and free access databases to cultural material are available in Finland, Germany, the Netherlands and further OECD countries. A couple of international projects have been created to allow wider access to resources. In September 2005 the European Commission adopted the "ï2010: Digital Libraries" communication outlining this initiative and addressing in particular the issues of digitisation, on line accessibility and digital preservation of cultural heritage, with EUR 96 million in project cofunding (including EUR 60 million in the eContentplus programme over 2005-2008) (see COM(2005)465final). Another important international project is "Bibliotheca Universalis". Annex 1, Table A1.2 gives details of the project.

There have also been some related private sector initiatives as Google Print's "library project". In the mean time other search engines and Internet companies have followed suit with similar initiatives to Google (Yahoo, etc.). The search engines' move to invest in this sort of project is driven by competition across search engines and by the desire to make content more accessible. Google's plans which were announced

publicly at the end of 2004, aim at making offline library information searchable on line. To do so, the company has made agreements with leading libraries to digitise their material. Google plans to make available full texts of books in the public domain. Furthermore, it plans to provide search functions on copyrighted works (essentially providing snippets of these copyrighted works when one searches), see also Annex 1, Table A1.2. The project has had some positive response, but the leading publishers' associations are concerned over possible copyright infringement as regards the search of copyrighted works. Moreover, some concern over a growing dominance of English-language sources on the Web has been voiced. Responding to this, the European Commission proposed a large project to provide European content on the Internet, including books and journals as well as film and video material from European libraries.

Search facilitation and other support projects

As in the case of digital educational content (see above), a large number of major projects seek to improve access to digital information by supporting the development of search functions, metadata research and broader inclusion of smaller and regional institutions (*e.g.* Collections Australia Network, Validation Experiment of Digital Archives). Many programmes also provide and support developing spaces for interchange and interactivity (*e.g.* Virtual Museum of Canada, IRCAM Forum, ARIM). A further group seeks to support artistic digital content (*e.g.* Telefilm Canada, UNESCO DigiArts) and also to preserve such born digital material (*e.g.* Internet Archive, 40JAHREVIDEOKUNST.DE).

Most initiatives rely upon government and ministerial funding, but in many cases specific institutions have been established to co-ordinate programs that introduce new technologies in the cultural sector (*e.g.* Department of Communications, Information Technology and Arts, Canadian Culture Online Strategy). Cultural institutions themselves have also initiated projects and some trans-national co-operation exists (*e.g.* the MINERVA network which was co-funded by the European Community).

Increasing access to public sector content

In order to use ICTs for wider cultural and educational content access, public institutions have faced various challenges. A survey of Canadian libraries and museums included: *i)* funding, *ii)* building capacity (*e.g.* developing necessary in-house expertise and technical infrastructure, *iii)* managing standards, *iv)* copyright clearance, and *v)* meeting the needs of target audiences (Wall Communications Inc, 2002). Further other analyses mention *vi)* preservation given technological change, *vii)* barriers to user access, *viii*) insufficient focus of digitalisation and iv) preservation of born digital content. Each of these topics will be dealt with in this study.

Technological obsolescence

The assumption that digitalisation of cultural projects is a "one time only" process whereby a digital copy of a cultural object (say, for instance, a painting) is produced, and afterwards no further actions are necessary, is often wrong. It creates a misleading impression of the challenges cultural institutions face in the digitalisation process. Longer term developments have to be taken into consideration to design online cultural projects successfully.

Importantly, technological developments have to be adjusted and adapted to for long-run digital preservation and diffusion. This is increasingly difficult because technological innovation cycles are shortening, challenges often occur at a pace of 2 to 5 years. Most striking examples are storage media, *e.g.* whereas diskettes were in frequent use some years ago, many new computers no longer have a drive to read them. Also, in contrast to books which may be useable for several decades, many recent IT storage media keep information for significantly shorter periods (Hedstrom, 2003). For instance, the useful life of a diskette ranges from 2 to 10 years and that of a CD-ROM is 20 years (Multimedia World Watch, 2003).

This means that preservation action has to be organized efficiently in order to keep "abreast of the increasing speed of technological development and to act accordingly (Smith, 2004)." Any preservation policy which does not focus on this issue is merely a short term rather than an actual solution.

Several types of obsolescence can affect a cultural project, these relate to *i)* equipment (*e.g.* computers, mobile phones), *ii)* media (*e.g.* CD-Roms, magnetic tape) and *iii*) software. Technical solutions to these problems are often costly. For example, software evolves rapidly, and if digital content is to be preserved it has to migrate to other formats. In order to access information from old computers, emulators[24] have to be developed. Furthermore, Web sites need to be updated in order to inform users on current events. Also, with the ongoing development of various new e-tools (*e.g.* interactive games), which attract many users, it is important to include these to provide useful new services (Multimedia World Watch, 2003, and Muir and Ayre (2004) for a review of technical obsolescence).

Several difficulties arise for projects that attempt to address problems of technological obsolescence. One issue concerns uncertainty about technology adoption and associated changes. For instance, two formats were available for consumer recording and viewing in the 1980s, Betamax and VHS. In the end, it was VHS which became the dominant standard in many countries. Obviously, to preserve information it would be crucial to use a format which is more easily accessible in the future. However, while it is important to be very cautious, a certain level of risk cannot generally be avoided.

A further challenge is that perfect technical solutions are not readily available at present. "The technologies, strategies, methodologies and resources needed to manage digital information have not kept pace with innovations in the creation and capture of digital information" (Hedstrom, 2003). Current conservation methods of digital media do not represent long-term solutions. Further, the task is made difficult as it demands ensuring maximum benefits for future users and their requirements - which are unknown at present.

In-house competences and organisational capabilities

With growing cuts in budgets for culture, many museums and cultural institutions have suffered from staff shortages and limited resources to participate in technical training programmes. For the EU, estimates suggest that in 2002 95% of all cultural heritage institutions lacked the conditions, notably qualified staff, to successfully develop digital culture projects (EC, 2002a).

As in all creative content industries, success demands co-operation between the creative and artistic sides and technology. In other words, a good mix of different competencies and technology has to be introduced into workflows. For various reasons, including interdisciplinary barriers at universities, most staff at museums have the former but not the latter type of skills. Hence without the provision of training courses and co-operation it is often impossible to develop innovative digital culture projects.

Focused and coordinated digitisation

The Internet contains a great volume of high-quality and useful information. However, this does not mean that the interested user will necessarily find digital resources which are relevant to his or her interests and purpose. This difficulty also arises for cultural information because often different institutions have adopted incompatible search systems. To give an example, in 2003 the Finnish Digitisation of cultural heritage committee remarked that "(t)he indexing memory organisations in their search systems are not uniform enough to make join information retrieval possible by present methods (KULDI, 2003)." This illustrates the point that to provide access digitisation is not enough, it is also necessary to avoid fragmentation. Furthermore, as a large number cultural resources exists, it is impossible to proceed to a general digitisation without making a selection focusing upon which items should have priority.[25]

Significant costs arise not only for digitisation but also for storage and metadata integration (see EC, 2002a for further details).

In order to ensure both the objective to avoid the fragmentation of national digital programmes and to focus on priorities, national cultural projects have to be well organised. That is, ideally all institutions should co-operate and digitisation should take place subject to an established set of standards and criteria. But shortcomings in planning and organising digitisation still arise. For instance, a study of Canada's digital content projects found that many cultural institutions did not act according to clearly defined objectives. Instead, they were unsure about their future digitisation plans, priorities and funding requirements (Wall Communications, 2002). The development of e-learning resources in the United Kingdom has also been assessed as "chaotic"(British Educational Communications and Technology Agency, BECTA, 2003) and the final report of the Digitisation of Cultural Heritage Committee (KULDI, 2003) set up by the Finnish Ministry of Education concluded that lack of co-ordination among memory organisations was a problem for successful digitisation.

Also for the long-term preservation of digital content, improved long-term management and funding guarantees are necessary (Hedstrom, 2003). This is due to two factors: *i)* there is a recurrent requirement to invest in preservation efforts of digital content given technology developments (see above) and *ii)* the quantity of such digital material is available in increasingly sophisticated formats. As a consequence of quicker technological obsolescence, the time period available to decide upon preservation policies is shortened and decisions have to be taken without long delays. In fact, preservation efforts have to be an ongoing process rather than a one-off event (Lavoie, 2004).

Intellectual Property Rights

In this context, the issues related to intellectual property rights (IPRs) are extremely complex and merit separate attention. In principle, IPRs recognise authors' rights over their creations and are meant to stimulate the creation of content resources. When trying to make content widely accessible, these intellectual property rights need to be respected. Rights holders themselves need to manage these rights and decide on the way they make these protected works accessible; sometimes those managing the rights are different from the actual rights holders. Depending on who owns the rights in which work and who is trying to make content available in digital format (a museum, a private entity, etc.), questions of varying difficulty arise; especially if the collections are meant to be comprehensive and widely accessible. In some cases, IPRs render wider content diffusion difficult and costly (Ory-Lavollée, 2002). Often difficulties are not so much related to required compensations but rather to the administration of copyright. The process of securing rights can sometimes be prohibitively difficult (Multimedia World Watch, 2003). Sometimes the challenge is to identify the relevant rights holders.

Legal restrictions are also a challenge for public institutions' efforts to preserve digital content. Most licenses only permit using but not copying resources. But current digital preservation strategies involve repeated copying of material and its migration to new formats (see below). This issue has been widely recognised. An extensive research project[26] at the Department of Information Science, Loughborough University investigated how copyright legislation to digital content affected its long-term preservation in the United Kingdom (Muir and Ayre, 2004). The study concludes that: "It is unlikely that the copying actions required to preserve digital material are legal under UK copyright law. (…) Other countries' laws which were investigated also do not address the rights issues of digital preservation adequately, if at all (Muir and Ayre, 2004)." Also, current licensing agreements have not been found most suitable for further developing greater home learning facilities (BECTA, 2003).

Sustainable public funding

Growing budgetary restrictions have strongly affected funding for cultural projects in a large number of countries. At the same time, digital cultural projects demand significant investments in technological capacity, skills and project development. In a survey on Canadian digital cultural content, the principal challenge for museums turned out to be funding (Wall Communications Inc., 2002). But the mission of cultural institution is to ensure access and wide diffusion of content; this impedes simple solutions to budgetary restrictions as to the pricing of provided services. Also, in many countries there is a strong conviction that public cultural content has to be freely accessible to everyone. The challenge thus consists in finding a way to come up for the costs without compromising the public mandate.

Inclusion of small institutions and lagging regions

As the DigiCULT (2002) study noted there were significant heterogeneities across European cultural organisations and their use of ICTs. Especially, smaller institutions and regions were found to face stronger challenges for digitalisation projects because they have fewer resources and often have limited advanced in-house capacities. Further, if they work independently, they cannot reap existing scale economies of digital content projects.

Access to high-quality content

With the widespread availability and diffusion of digital cultural and educational content, it is also important to remove barriers inhibiting access to digital networks. Different barriers to access exist as individuals may not have access to the Internet, have limited IT skills or cannot make use of conventional Web content given physical and intellectual impediments (EC, 2002a).

A further requirement for digital cultural projects is to bear in mind that the aim is to diffuse information rather than merely to provide it on line. This means that cultural content programmes should aim to attract users and to provide useful services. If this is not taken into consideration, investments in digitisation risk being lost in projects which are hardly used and serve no policy objectives. There is evidence which suggests that many digital culture projects have not sufficiently considered demands of targeted users in project planning (Wall Communications, 2002; EC, 2002a). Furthermore, public institutions also have to pay attention to the quality of digital content; this is of specific importance for educational resources.

Preserving born-digital content

The Internet regroups a large amount of diverse information and content. This also includes various digitally-born artistic[27] and cultural creations (EC, 2002a, Multimedia World Watch, 2003). The main challenges for the preservation of born digital content are the following:

- The nature of the Internet is such that much content disappears within short time horizons.[28]
- Current regulatory frameworks (including copyright regimes) may need to be adapted to provide a better basis for digital preservation.
- Until recently there has not been sufficient awareness of the needs of digital preservation among the main institutions involved – libraries and publishers (see *e.g.* Muir and Ayre, 2004). This also includes content creators themselves, their creations cannot be preserved *e.g.* by the Internet Archive if they use specific software to protect copying and redistribution.

- Effective and affordable digital preservation models do not exist at present, the question of long-term storage needs to be addressed (KULDI, 2003; Hedstrom, 2003). Further the task is more complicated as data collection, content creation and their complexity are growing.

- The question of who takes which responsibilities in preservation has to be reconsidered and answered. Many libraries currently subscribe to online sources. As they do not own the material, the availability of these resources depends upon the publisher. But if libraries cannot preserve material, the task falls upon publishers. However these have not traditionally been involved in preservation and may not have an interest to do so (Muir and Ayre, 2004).

- Efficient business models which provide sustainable funding for preservation have to be provided. Archives of digital content seek to collect and preserve a range of material the value of which may arise only for future generations. Many do not provide any immediate economic benefit. This means that it is difficult to ensure preservation via market incentives. Also joint efforts at preservation are more likely to be able to finance efforts adequately (Hedstrom, 2003).

POLICY ISSUES FOR PUBLIC SECTOR INFORMATION AND PUBLIC SECTOR CONTENT

This is an overview of the main policy issues which are important to support private PSI re-use markets and to improve the diffusion of public content. This final section also looks at different policies that have been adopted in OECD countries to address these. Technological aspects (new content repositories, standards, interoperability, etc.) which may be relevant to efficient access and management of PSI are not included, neither are issues related to digital content in general such as ICT infrastructure development.

Commercial re-use of PSI

Roles of public and private bodies

Two general questions define the roles of public and private sectors respectively and policies regarding PSI:

i) What information should the public sector produce? How should PSI be financed and used?

ii) What information should be made available for commercial re-use? Under what terms and conditions?

As discussed above, there are several ways to exploit PSI and three of these involve public sector participation. In Europe, where these business models are more frequent, this has sometimes led to competition between unequal players, that is between public and private institutions. Several projects have been proposed to create fair conditions for competition between them:

- One approach is to implement rules which firmly establish *i)* how public value-added products and services have to be priced and *ii)* under which conditions private companies are allowed to access PSI. This was done in the United Kingdom, in 2000 the Information Fair Trader Scheme (IFTS) introduced. Box 8 outlines the principles verified under IFTS.

- Another solution is to define and divide functions and activities of public and private sectors. This excludes competition between both as they produce different products. This is very much the case in the United States. Public institutions generally restrict activities to those with natural monopoly characteristics and essential public services (*e.g.* storm warnings). Some countries clearly separate commercial activities into a commercial entity, *e.g.* the Netherlands have done so in the case of meteorological information.

Another final approach is to experiment new market models which involve private/public partnerships; this allows developing a better understanding of necessary conditions for successful co-operation (Commission of the European Communities, 2001), however there are issues of non-exclusivity and partner selection to be addressed to ensure that competitive markets are developed to serve the public interest. Joint production is another way to improve conditions for private market participation as it removes competition between both.

Box 8. Principles verified under the UK Fair Trader Scheme

- Openness – that the organisation maximises the information available for re-use.
- Transparency – that the organisation has clear and simple policies and procedures.
- Fairness – that all customers are treated the same.
- Compliance – that the organisation's procedure should comply with the first three principles.
- Challenge – that the organisation has a robust complaints procedure.

Source: HMSO, 2004.

Non-discrimination

Discrimination between comparable re-use categories can distort the market. This holds especially true when licence conditions do not depend on the form of re-use but on whether the user is public or private (there are certainly some justified exceptions such as educational institutions etc.).

Access to PSI

Several suggestions have been made to overcome access difficulties. One proposes a high-level executive office for national information policy should be established. There should also be a Chief Information Officer in each significant government organisation (UNESCO, 2004). A further improvement would be to create a central integrated online database ("one stop shop"). In fact, many OECD governments have set up such central interfaces. For instance, online access to comprehensive US federal government information is available.[29] Similarly, since 2002 a Web site provides information on the contents of Danish public databases. It also provides information on access and re-use conditions of these data.[30] The Hungarian Ministry of Informatics and Communications is currently creating a central searching system to make data easily searchable and retrievable online. Also, several portals for specific data have been established, this includes, for instance, e-geo.ch an initiative which seeks to facilitate access to Swiss geo-information.[31]

Access conditions also need to be clarified. Restrictions might include statutory exemptions to public domain access and use if national security concerns, personal privacy protection and confidential data (such as trade secrets) are involved. Furthermore, often access does not necessarily imply rights to commercial re-use and some countries protect access to and use of governmental information with intellectual property law (UNESCO, 2004). There are also national government initiatives which try to facilitate access. For instance, the Danish Ministry of Science, Technology and Industry is developing an "access to data database" that describes major databases and information on access and re-use. The Web site will be available in 2006. The Danish government has also carried out an analysis of specific barriers to data access in order to formulate policy initiatives that address these difficulties.

The 2003 EC Directive on the re-use of public sector information is a legal instrument that has been transposed into national legislation by the EU Member States. It gives a major impetus to policies in this area but does not affect access regimes in different countries or what citizens have access to; it establishes a number of rules to facilitate re-use, referring to rules on processing requests, transparency, non-discrimination, formats and other arrangements (EC, 2003).

Technology and data quality developments

Improvements in technology also improve market possibilities for PSI "re-use" industries. For instance, the ability to transmit large information files across mobile networks has increased the potential for information service provision. Several projects seek to improve technological possibilities. The aim is not only to widen market potential but also to give incentives for smaller firm market entry. The idea is that if technologies are readily available, necessary investments for firms that enter the market will be lower. One such project is the eContent Plus programme (2005-2008). Its aim is to improve the quality of digitally broadcast applications which are applicable in industry, trade, science and society (EC, 2004a). For instance, this includes work to optimise use of network bandwidth characteristics for service delivery. Further, the development of "intelligent content" *i.e.* content that is adaptive to content and user information needs, can permit substantial advances in product offers. Similarly, in Austria studies are carried out to see how digital content engineering principles can be applied to improve the production of digital content. This includes, for instance, research on knowledge-based search and retrieval technologies.

Furthermore, data quality is an important condition for the development of innovative PSI "re-use" industries. Several efforts have been made to improve various aspects of public information. For instance, the Czech Ministries of Informatics, Transport and Interior are currently involved in a project (Single system of transport information, SSTI) that aims to ensure the joint methodical collection of transport data and the integration of processes through data sharing at cross-border level. Another policy project is the European Commission's INSPIRE, the INfrastructure for SPatial InfoRmation in Europe initiative[32]. This programme addresses the fragmentation and lack of harmonisation of national spatial information datasets and the resulting problems such as information duplication, data access and difficulties of use. The aim is to provide improved harmonisation and quality of datasets. Specifically this should allow users to discover available information easily, to know its conditions of use, and to combine and share different data for specific purposes.

Ground rules for access to Public Sector Information

It has been suggested that if agreement on general principles for PSI policies can be established, it may be possible to work towards international harmonisation, for example to improve cross-border access to PSI. Different sources have proposed such ground rules;[33] an interesting set of principles is provided in Box 9 (Burkert and Weiss, 2004).

Box 9. Possible ground rules for PSI policy

1. Inventory principle - Public sector institutions should make an inventory of their information holdings, update it regularly and actively make it generally and easily accessible.

2. Access principle - PSI holdings should be subject to a regime of access principles. These comprise the right of anyone to obtain PSI Exemptions should only be based on consideration of personal privacy, preservation of significant private commercial interests where explicitly protected by copyright, or legitimate national security concerns.

3. Quality principle - PSI holdings should be provided in the same quality as they have been provided by the public sector.

4. Cost principle - The costs chargeable to any requester should not exceed marginal costs of distribution; there should be the possibility to waive such costs in cases where requesters can show a specific public interest is involved.

5. Choice principle - If available (or if easily transformable) Information should be provided in the requested format. . The requester may be charged with transformation costs, provided administrative costs of recovering these do not exceed those.

6. Intellectual property rights and control of origin principles - PSI holdings should be exempted from IPR and also copyright and data-base protection regimes. The public sector should, however, be entitled to ensure through minimal regulation that responsibilities for any changes to the original information after its transfer are made appropriately transparent.

7. Legitimate improvement principle - Public sector institutions may extend, improve quality and format of their information provided they do so after a transparent procedure and in order to improve quality and/or extent of their services. Public bodies should not "feel compelled to discontinue a service that is to the public benefit simply because a commercial vendor chooses to duplicate it. […] Information vital to the public interest should not be "captured" by any entity, particularly in the private sector, which has economic reasons for controlling access".[34]

8. Continuity of obligations principle - PSI activities even if transferred to the private sector are subject – to the extent of their privilege – to the same principles as PSI holdings.

Source: Burkert and Weiss (2004).

Pricing: wide low-cost dissemination versus cost recovery

Pricing policies range from free dissemination and marginal cost (dissemination cost) pricing to various levels of production cost recovery plus profit pricing (average cost plus "reasonable return" pricing). As public bodies are "non-profit organisations" and interested in information dissemination, profit-pricing is relatively rare. Until recently, in Europe it has been common that charges are raised to partially recover production costs. But the pricing of public sector information is undergoing changes; the 2003 EC Directive on the re-use of public sector information (2003/98/EC) has brought about changes in national policies for the re-use of public sector information. It builds around five main ideas:

- Minimum harmonisation to facilitate cross-border use.
- Transparency of conditions.
- Avoid abuse of market power.
- Non-discrimination.
- Clear procedures, lists of assets, online licences.

With respect to charges the Directive specifies that where charges are made, the total income from supplying and allowing re-use of documents shall not exceed the cost of collection, production,

reproduction and dissemination together with a reasonable return on investment (EC, 2003). In response to the Directive, in June 2005 the Danish parliament passed a law that aims to improve access to data for the private sector and which imposes marginal cost pricing for these data. In the United States federal information is often free and at most priced at the cost of dissemination.

It has been suggested that free access to PSI would stimulate related economic activity and increase tax revenues by more than the revenue raised by charging for PSI access. According to the Pira (2000) study the EU market would not even have to double in size for governments to more than recoup in extra tax receipts what they would lose by ceasing to charge for PSI. A study that examined both qualitative and quantitative effects of different pricing models in the Netherlands concluded that positive aggregate economic effects will be maximised when data is sold at marginal cost (defined as all costs related to the dissemination of PSI which includes shipping, promotional costs, personnel and IT costs) (Berenschot and *Nederlands Economisch Instituut*, 2001).

While models based on marginal cost-pricing, as opposed to cost-recovery, have been frequently defended there is still need for further analyses to clearly understand comparative economic, political and social gains from different pricing.

Competition policy

In order to promote business use of PSI, some countries have taken a more pro-active stance and seek to foster competition and company entry in these markets. For example, the Korean government has formulated specific "Digital Content Industry Promotion Policies". In the context of these policies, the government supports an investment fund for the development of digital image contents. It also finances technology and human resource development in areas related to digital images, mobile content and games. Also, in order to promote the participation of small and medium-sized enterprises in trans-national e-content co-operations, the Austrian Ministry for Economic Affairs and FFG provides financial aid for these firms' costs of participation in eContent plus projects. Also Hungary has adopted measures to support the information digital content industry.

Privacy and consumer protection

A range of privacy and consumer protection issues are associated with the potential release of personal information. The section on geo-marketing above gives further detail. Another important issue is protection from harmful content. Specifically as the Internet becomes a widely used learning tool for children, consideration has to be given to adequate protection mechanisms.

International co-operation

Products and services that typically depend on cross-border information include weather forecast and weather risk management such as disaster prevention. Moreover, applications based on geographic information such as navigation products often require international data. One aspect firms are faced with in sourcing PSI information globally is diverging access regimes which can result in incomplete data coverage.[35] International co-operation and co-ordination on various aspects of commercial re-use of PSI are therefore important.

In order to address some of these issues, the European Parliament and the Council have recently approved the eContentplus Programme.[36] The 4-year programme (2005-08) has a budget of ERU 149 million and aims to make digital content in Europe more exploitable and usable. Specifically, it seeks to address some key cross-national barriers. It focuses on three main areas, one of which is geographic content. Main objectives here are to stimulate the aggregation of existing national data into trans-national datasets in order to provide better conditions for new information products. In relation to this

project, Austria, the Czech Republic, Slovakia and Hungary have launched a joint initiative to promote digital content. A series of workshops on digital content, public sector information, geographic information systems, and cultural content will be organised in these countries (see www.econtentplus.net).

Increasing access to public sector content

This section deals with specific policy issues associated with the availability and preservation of public content. Different policy approaches have been taken to promote and support digital online culture. Their impacts have been varied, and it is important to say that many projects may not succeed in the way expected because the functions, purposes and business models of the Internet are still developing. The following focuses specifically on the roles and benefits of networks, various approaches to promote access and quality as well as training and technology requirements. It further discusses copyright and proposed solutions, possible ways to achieve sustainable funding and finally, various initiatives which deal with born-digital content. Several studies have dealt with specific aspects of digital cultural content; the recommendations of two are given in Annex 2 (Multimedia World Watch; 2003 EC, 2002a).

Network benefits

Institutional networks are frequently mentioned as an approach to address diverse challenges of digital cultural content (EC, 2002a, Multimedia World Watch, 2003, Wall Communications, 2002). For instance, one of the conclusions of the Canadian E-Learning Programs was that co-operation enabled significant, otherwise unavailable benefits of inter-organisational collaboration (Rossiter, 2005). Further, the Internet itself provides new and lower-cost possibilities for co-operation across different institutions and actors. Various types of networks may be useful to address the challenges of including small, regional and low-resource cultural institutions, provides better access to available online cultural and educational resources, lower costs and improve quality by pooling resources, reaching users more effectively, addressing legal issues, facilitating cross-sectoral co-operation. Creating effective institutional networks that provide expected solutions is not straightforward. Frequent problems are that *i)* few actions are taken as members disagree or *ii*) open structures lead to little actions and a growing loss of interest in the benefits of networks, etc.

Small, regional and low-resource cultural institutions

Networks can support small and regional institutions. With regards to strengthening regions, the experts participating in the DigiCULT study recommended stronger co-operation between cultural institutions to foster technology transfer. A suggestion was to fund mainly projects where smaller and larger institutions were jointly involved. A further recommendation was to set up online networks that allow better visibility for small cultural institutions and their activities. Also, the EC has strongly emphasised the need to improve the pooling of resources via the creation of "competence centres". These should act as channels for technology transfer also to small and regional institutions. Moreover, the learning initiative Minerva (Annex 1, Table A1.2) aims to improve dissemination by providing information on good practices,[37] tools and standards (EMII-DCF – Minerva, 2003).

Pooling resources to lower costs and improve quality of digitisation

It has been widely recognised that collaboration across institutions and sectors is important to improve cultural online content. It brings together technical, artistic, educational and other related competencies and the combination of these produces improved results. Furthermore, co-operation between private and public institutions may provide useful and interesting results for digital content creation. Also, cultural institutions face similar challenges when it comes to digitisation, hence, exchange is valuable to avoid duplicating research efforts and projects which experience has already shown to be unsuccessful. Moreover, there are

cost savings if several institutions use software and/or portals jointly and share operating expenses. This is because many technical tools can be used for various sites and do not have to be developed separately. In summary, co-operation allows significant economies of scale and scope.

These network benefits are widely recognised. For instance, the press declaration announcing the creation of GLOBE (see Annex 1, Table A1.1) read: "We found that each organisation was trying to solve similar problems at the same time and in different parts of the world. It made great sense to form the alliance (EdNA, 2004)." For the same reason, the Canadian E-Learning Program created a forum for information dissemination; so that standards, protocols and best practices could be shared among projects (CANARIE, 2005). The DigiCULT study (2002) also emphasises the importance of pooling experience by disseminating guidelines, good practices and standards. One of the proposals was to create centres of expertise, advice and assistance in order to stimulate the exchange of information. Evidence on the performance of these centres suggests they act as channels for technology transfer. However, frequently small and medium heritage institutions were not as strongly involved (EMII-DCF – Minerva, 2003). Other information networks of smaller and larger scales have been created. For example, Kennisnet (see Box 10) has established information partnerships with BECTA and the Danish UNI-C. The Conference of European National Libraries (CENL), started in 1987, has also become a useful forum to jointly discuss challenges of digitisation. It is in the area of private-public co-operation that fewer networks have been undertaken (EC, 2002a).

Box 10. Kennisnet

Kennisnet is a not-for-profit Internet organisation for primary, secondary and professional education in the Netherlands. Founded in 2001 by the education organisations it creates virtual space for learning and educational processes but does not create content itself. In 2004, the Web site received on average 750 000 visits per week; in early 2005 more than 1 million visits were registered. Via the educational search machine Davindi, which was established in collaboration with libraries, content can be search for.

As a focus for 2005, the institution aims to improve client-oriented services and content awareness. As steps towards yielding this aim, Kennisnet plans to initiate discussions with target groups: school pupils, students, teachers and managers across all levels of education. Further, the institution does not merely seek to raise awareness of available services, but also wants to obtain stronger involvement and content-based contributions from users.

Source: Kennisnet, 2005.

Improve cross-sector access to online cultural and educational resources

As mentioned above it may be difficult to find all relevant digital content on the Internet. Generally users will not readily find all available resources – specifically at an international level – if they rely on one search process to retrieve information. Co-operation among different cultural institutions can significantly improve access to joint resources, for example via common portals. Further, if institutions can agree on a common set of standards and structures, this further facilitates common search. Several networks, *e.g.* AMICO, address these issues; further examples are given in Annex 1.

Stimulate technological and organisational development

For digital preservation, it is important that cultural institutions co-operate with research institutions and software industries. A substantial benefit is that this allows cultural institutions to explain precise requirements and demands to product providers. Until recently, it has often been the case that each of these groups operates in distinct networks. For instance, in Europe the co-operation between academic researchers and the IT industry has only just started to become more important (EC, 2002a). A useful first step to stimulate further interaction is the organisation of conferences and events. This may serve to join and build contacts between academic researchers, private industry and public cultural institutions.

Community development

The Internet is not merely a means for diffusing content, but it also provides important tools for different forms of interaction. The interactive nature of the Internet could in fact improve the diffusion of cultural content. The important aspect is that the Internet provides opportunities for users to contribute their own digital material and take part in cultural projects. There are different sorts of contributions to cultural online projects and benefits depend on intensity and nature of the contributions (Multimedia World Watch, 2003). The following summarises the main benefits of user participation:

- User feedback is useful in order to adjust services and projects to respond better to user demands.
- Users may contribute content themselves. This opens up the possibility to collect a lot of valuable material. As many contributions will be made out of personal non-commercial interests, their supply will not be costly. Hence, if users are active contributors, valuable content products can be created at relatively low prices.
- User involvement may strengthen content re-use and create new valuable content.
- Users may co-develop cultural online Web pages. The example of open software suggests that co-development is a possibility. The cost savings and benefits of it are very large; consider *e.g.* estimated development costs for Linux.
- Active participation in the development of a Web site may develop a user interest in the existence of the community. As a consequence, they may be willing to pay subscription fees to provide funding for the Web site.
- Participation often also increases interest in accessing and using cultural and educational content.

Several initiatives of the Culture Online Project (see Box 11) try to encourage user participation. Other examples are the EC initiative Cipher (see Table on cultural projects above) and the French Ircam Forum. The former provides members with tools which facilitate contributions to websites. Several Web sites which deal with a specific topic have been created; their development depends upon their members and their motivation to continue discussing the specific topic. However, there is no policy that allows creating cybercommunities systematically. Most successful projects developed rather spontaneously (*e.g.* Photo.net[38]) whereas many others failed. In general, it is easier to support existing communities than to create them from scratch.

What can be done is to develop tools that make contributions easier (Multimedia World Watch, 2003). Also, among the main conclusions from the Cipher project were that for the community activities to develop successfully financial support and assistance with technical tools and design were necessary (Cipher, 2004).

Box 11. Culture Online

Culture Online İs an innovative initiative of the UK Department for Culture, Media and Sport which aims to "bring together cultural organisations with cutting-edge technical providers" to create interactive projects which address different audiences including children and audiences with disabilities. Most of them have an underlying educational purpose and various projects also seek to promote social cohesion and integration.

Composed of a specialist team from a variety of areas including broadcasting, technology and publishing and co-operation with various partners, Culture Online has been very successful and its projects have been awarded BAFTA Interactive awards. Examples include Headline History, an interactive Web site designed for children's exploration of history, and MadforArts, a project that collects art experiences of people who have experienced mental distress. Upcoming projects seek to provide further interactive experiences *e.g.* with film and music.

Source: Culture Online (www.cultureonline.gov.uk/)

Policies for access, diffusion and quality

Portals

Various countries have supported the creation of portals in order to make it easier to find resources on line. Many of these sites also provide search engines. Currently, most initiatives seek to increase the range of digital public content which is included in existing Web portals, and many specifically aim to improve search functions and to address user demands. Furthermore, increasingly specific portals are created (BECTA, 2003). These thematic portals can provide further detail and address demands of interested users if general portals become very large. Annex 1, Table A1.2 summarises some of these projects.

Metadata and standardisation

Metadata attribute information to content and are related to the contents of works such as periods, authors and descriptions, and the information related to right holders and conditions for use. They are of big importance for content preservation because they give information on existing collections. Their harmonisation facilitates common access to and search for information as well as re-uses. Hence, a wider agreement upon common shared metadata standards is crucial for diffusion.

Many countries have supported research on this topic, but different systems have been adopted (see *e.g.* PANDORA - Preserving and Accessing Networked Documentary Resources of Australia - Web Archive system, a collection of Australian online publications, established initially by the National Library of Australia in 1996). BECTA has emphasised increased demands for interoperability across e-learning networks. The Information Management Strategy project was created to establish standards in various areas including software and digital information collection and also transfer (Kearns, 2002). In order to improve interoperability more successfully, BECTA wants to involve industry representatives in discussions over agreements on standards.

Box 12. Validation of Digital Cultural Heritage Archives in Japan

To standardize metadata, the Content Development Office of Japan's Ministry of Internal Affairs and Communications conducted a validation experiment of digital cultural heritage archives. The experiment included a total of 8 945 content items provided by 11 co-operating museums in Japan.

Research focused on five main areas:

1. Investigation and definition of Meta-data

Defines profile limited to specific meta-data items required for cultural heritage online services, guarantees harmonisation with existing meta-data and provides tools for conversion to a common meta-data scheme.

2. Search, Application Control, and Copyright Protection Systems

Realises advanced search corresponding to the defined meta-data, imposes application limits and copyright protection according to copyright protection included in meta-data (*e.g.* can be viewed and listened to until the specified time elapses, or storage and printing are prohibited).

3. Secondary Use of Content

For example, the content scattered in each museum are transversely collected to hold virtual thematic exhibition by making a search according to a specific theme.

4. Income Revenue Share Processing System

Distributes income and profits based on meta-data in each museum.

5. Secure Browsing and Utilisation of Content

Validates the system in which content can be securely used when third party acquires frequently distributed content using digital watermark and metadata information.

Source: Content Development Office (2005).

Korean education content policies emphasize standardisation to develop an effective e-learning system. The "Promotion Plan for the e-Learning Industry" and the "2003 Plan for using ICT in Schools" (Ministry of Commerce, Industry and Energy, MOCIE) stressed the importance of industry standards, common formats for educational content and standard metadata to improve access to digital material (MOE – HRD, 2003). The White Paper Adapting Education to the Information Age (2003) also emphasises the benefits of guidelines for standardization and content quality.

Analysis of user needs and capabilities

In order to be useful it is important that digital content projects consider user needs and their capabilities to access content. Many recent projects increasingly try to do this. For example, the Canadian Cultural Content Forum includes the intended audiences as an important element of its analysis of Digital Cultural Content (CulturalContentForum, 2003). The Kennisnet project (see Box 10) aims to respond better to user demands. In order to do so, users are invited to express their opinion and to participate in content services and product offers.

Furthermore, in order to encourage use, various projects (*e.g.* of the MarcoPolo Education Foundation) have organised workshops and meetings with key target groups (*e.g.* teachers and students for educational content). These do not only provide information on content but more importantly they show how to use Web-pages and can be very successful to increase the user base. Also, the interactivity of the

Internet can be used *e.g.* online surveys, forums and feedback forms can give useful feedback to improve Web sites.

Provide technology to users

It is necessary that users have access to and are able to use ICTs and policies which aim to improve basic IT skills and access are also important for cultural content diffusion. At the same time available content can act as a driver of technology adoption. In the context of cultural/educational diffusion, important user groups such as school children have been targeted. For example, in the United States the E-rate provides discounts to assist schools and libraries to obtain telecommunication and Internet access.[39] Specifically for educational content users, better connections are often necessary, and for this reason, Korea is investing efforts into improving school IT infrastructures. With increasingly innovative digital cultural content, policies which support the diffusion of broadband content become important to guarantee diffusion and equal access.

Awards, standards and institutional quality reviews

A popular way to stimulate quality production is to award certificates and prizes. For instance, Korea has developed a system that certifies the quality of educational software. Until 2002, 563 software products had received the quality recognition (MOE-HRD, 2003). In a similar way, BECTA supports the BETT awards which reward high quality technological products and services in education.[40] Another possibility is to organize peer reviews, an example of this is the British Teachers Evaluating Educational Multimedia (TEEM) scheme (Kearns, 2002). There have also been institutional approaches to ensure quality of e-learning content as *e.g.* the Australian Learning Federation. Annex 1, Table A1.1 provides further detail. Also, as most of the funding of cultural projects is public, governments can exercise a more direct influence upon the quality and standards of programmes.

Co-ordinating cultural and educational digital content

In order to avoid fragmentation of digitisation efforts and to improve clear policy formulation, many countries have created special institutions and/or initiatives which co-ordinate digitisation projects. Specifically, public institutions have been very interested in developing educational digital content. An example of an institutional solution is the UK agency BECTA which deals with ICTs in education. Austria has taken a different approach; efforts in education and culture are united under the eFit Initiative of the Austrian Ministry of Education, Science and Culture (see Box 13). Clear government support of initiatives as is the case in Korea also ensures attention and potentially joint action of diverse social actors and agencies. In Korea, Article 15 of the Lifelong Learning Act establishes that "the government and local self-governing bodies must actively pursue the development of lifelong learning courses that include the use of ICT in education and network schools, private institutions, and private companies (MOE-HRD, 2003)."

Box 13. eFit Austria - Supporting new technologies for Education, Culture and Training

With the eFit Initiative the Austrian Ministry of Education, Science and Culture (bmbwk) has taken an active role in supporting and funding the use of ICTs in Education, Science and Culture. The Initiative's Web site (www.efit.at) constitutes a platform that provides access to the various projects; these contribute towards enhancing *i)* eEducation, *ii)* eTraining, *iii)* eScience, *iv)* eCulture and *v)* eAdministration.

In terms of training and education, the bm:bwk provides electronic learning and teaching material and other related information to all Austrian schools via specific Web portals (http//:www.bildung.at and http://www.schule.at). The project *Neue Medien in der Lehre* (New Media in Education) funded 25 projects and initiated active discussions on the use of new media at universities (http://www.nml.at). The project, which ran from 2000 to 2003, also created a network spanning universities. To stimulate ICT use at universities further, the bm:bwk has decided to invest around EUR 3 million in funding projects that develop conditions for ICT applications at institutions of further education. The ministry considers this step of particular importance for meeting the demands of a Lifelong Learning Society. The central aims of eCulture are *i)* to preserve cultural heritage for future generations, *ii)* to stimulate the discussion on cultural and knowledge heritage; and *iii)* to provide wide access to the "memory of the nation" (*Gedächtnis der Nation)*.

To realise these, various policy recommendations from the DigiCult (2002) study were implemented. In addition to financing a large number of digitalisation projects the bm:bwk also invested in the creation of a national source for complete information on digitalisation projects as well as best practice models and guidelines (www.digital-heritage.at/). There has also been an effort to establish a stronger link between education and culture through e-projects involving schools, teachers and cultural institutions. Among aims to be realized for 2006 also figure the promotion of know-how transfers to institutions via competence centres, contribution to European guidelines for digitalisation and enhancing a stronger use of resources by various target groups.

Sources: eFit Austria and bm:bwk (2003).

Technology and training

Human capital development

Some specific capabilities are important to develop online digital cultural content. The DigiCULT study (2002) recommends investment in human capital. Further, it is optimal that the "right mix of competencies" be obtained, and the creation of Centres of expertise, advice and assistance to provide an infrastructure that would encourage skill development was proposed.

Technology research

A range of technological barriers limit digital cultural diffusion and preservation, and research in both private and public institutions is important. Further research could *i)* find cost-effective long-term solutions for digital preservation, *ii)* decrease the cost and improve the quality of online cultural projects,[41] *iii)* facilitate interactivity and Web site features to attract more users, i*v)* improve the online cultural and education experience (*e.g.* by developing suitable games, develop artificial intelligence further), *v)* provide solutions for preservation of Internet content.

The necessity to address technological issues was emphasised by the 2001Lund principles which were agreed upon by European governments.[42] Currently, the European Commission Information Societies Technologies (IST) Programme[43] co-funds research projects that focus on the retrieval of cultural and scientific information; it also funds research on digital content preservation. Some suggest that the development of open source applications may be very useful for online cultural content (EMII-DCF – Minerva, 2003). There is also a need to see how technological possibilities can improve user experiences. As an example, the Swedish Interactive Institute develops interesting projects to improve user experiences by developing projects connecting arts and science.[44] Another important area for research is the long-term preservation of digital content.

Copyright collectives and Creative Commons

Many specialists and reports argue that there is a need for renewed negotiation of licensing models in order to address the problems these cause for content preservation and diffusion. This should ideally include all the parties involved (from creators to copyright owners to consumers of this content). Among the main topics are *i)* whether libraries should have rights to copy digital material for preservation purposes and *ii)* which access conditions should hold for academic and educational communities. Furthermore, some argue *iii)* copyright administration has to be simplified to encourage re-use. Finally, there is the more general question of *iv)* how to deal with content in the specific case of the Internet (Muir and Ayre, 2004; Multimedia World Watch, 2003; EC, 2002a).

The Legal Deposit Libraries Act 2003 allows UK legal deposit libraries to copy digital materials for preservation (Muir and Ayre, 2004). But further action may be necessary. Many institutions in the United Kingdom favoured collective licensing approaches which would include optional clauses covering preservation and access. At the level of the EU, Directive 2001/29/EC on the harmonisation of copyright in the information societies provides exceptions for specific forms of reproduction by libraries, educational establishments, museums and archives (EC, 2001). However as it is not mandatory to implement exceptions, national implementation of this provision differs. In the context of the European Commission's project to provide Europe's cultural heritage on line, the Commission has recently launched a consultation on legislative measures to facilitate digitisation and access to copyright material.

Some authors are unsure about their legal protection over creations if these are provided on line; as a result they often do not put their material on the Internet. In many countries, *e.g.* the United States, full copyright protection applies to original material which is provided on the Internet. This is the case whether or not the author has specified this. But often authors do not want to build these barriers and would be willing to apply weaker protections. (This may be because authors want to diffuse content or because they wish to have contributions to their work.) The Creative Commons aims to facilitate this diffusion by proposing a more flexible form of copyright (see Box 14).

Box 14. Creative Commons

In December 2002, as a first step the organisation realised a set of copyright licenses as online applications for creative works (such as Web sites, film, literature, etc.). This permits users to contribute their works to the public domain or retain copyright but authorises some uses (*e.g.* non-commercial re-use, distribution) under specified conditions. The tools provided are *i)* a simple explanatory summary of the license, *ii)* the legal code of the license and *iii)* a digital code (this allows for search engines and other applications to find terms of use). Once obtained, the user merely needs to include a Creative Commons "Some Rights Reserved" button on his/her Web site linking to the license terms.

There are ongoing efforts to establish licences for all world jurisdictions. So far, including the United States, licences are available for 13 OECD countries,[45] and work is being undertaken in a number of others to integrate these. For instance, authors may choose protection that allows diffusion and re-use except for commercial purposes, they may also be restrictive and merely allow distribution. These tools are important as in many legislative contexts including the United States "by default" they retain complete rights over their content and a legal statement (such as that provided by Creative Commons) is necessary to state the contrary.

In the cultural content domain, teaching and cultural material have been made available using Creative Commons.[46] As an example, access to the BBC archive (see Annex 1, Table A1.2) is based on the Creative Commons model; and files can be stored, manipulated and shared. Further, they have developed metadata which provide the opportunity to search content with respect to its public content status (*e.g.* find music that may be copied). This way freely available material may be identified more easily to facilitate diffusion and re-use further. In March 2005, Yahoo! provided a new Creative Commons Search Beta which allows finding content according to the terms of content reuse (*e.g.* content that can be used for commercial purposes).

Source: www.creativecommons.org

Financing online cultural projects

Cost efficiency

As in many other areas of public services, greater cost efficiency can be achieved by adopting a results-oriented approach which tracks expected results and evaluates outcomes of current projects to facilitate for future planning. Furthermore better co-ordinating may achieve significant cost savings.

Business opportunities

Online education markets

Online education markets offer major opportunities; however this requires private industry (the supply side) to provide content and potential users (the demand side) to perceive the benefits of use. Policies for online education have been implemented in a number of OECD countries. For example, in Denmark in the 2004 action plan "IT at the right time and place", there is an initiative to inform small and medium-sized businesses of relevant e-learning projects. Another example that seeks to address both demand and supply side is the Italian CIPE Scuola programme (Box 15). Korea has created an exhibition called EDUEXPO in order to promote private sector contributions to the online education market. Since 1998, the exhibition unites educational software developers and school administrators to provide developers with the opportunity to promote their products (MOE – HRD, 2003). However, the private sector will only service profitable, and in Finland educational resources are committed to provide missing markets (Kearns, 2002).

Box 15. CIPE Scuola: Creating a market for e-learning

"CIPE School" is a project of the Italian Ministry for Innovation and Technologies in collaboration with the Ministry of Education, University and Research (MIUR). It seeks to introduce technologies in school learning via the development of digital content. The main objective of the project is to develop a digital content market by stimulating both the *demand* (school, teachers and students) and the *offer* (content industry and publishers). The project disposes of EUR 25.9 million and will run from 2005-2007. After an initial implementation in a sample of schools plans are to extend it to all Italian schools.

Initially 200 schools with adequate infrastructures and ICT competencies participate; these schools will implement digital content in their educational programme offer. The idea is to create a "marketplace" to which publishers have access and which specifies certain demand and precise technological and pedagogical-didactical standards. For purchases, state Schools will receive vouchers to buy licences to use learning tools on this platform, the idea is to offer teachers the choice between alternative products.

Source: *Progetto CIPE Scuola* (www.innovazione.gov.it/cipe_scuola/index.html)

With business sector provision, the most frequent models are: charge user fees (subscriptions or per use charges); opportunities for visibility and advertising; selling related products and services; and/or licensing rights for digital content use.

Private-public partnerships

In private-public partnerships private companies co-operate with public institutions in digitisation efforts. Examples include the Spanish telecommunications provider Telefonica supports digitisation of catalogues and documents of the *Biblioteca Nacional* and the *Biblioteca de Catalunya*, and Banco Santander is involved in a major Spanish language literature digitisation project.

However business support does not always provide clear-cut benefits. For example, a private company may request Web-space for advertising in exchange for funding. This may affect user perceptions of the information provided and of the cultural institution involved, and alter the kind of content published

and/or distract from the main aims of Web sites. However, despite such caveats, support can provide important support for digital cultural and educational projects and give few negative effects. However, long-term private funding of large cultural digitisation projects usually requires firms to value online visibility and advertising highly (Multimedia World Watch, 2003).

Commercialisation

Content digitisation can also be financed by user charges. Although the overall aim is to maximise access, charges may be levied for some content or forms of access while access to general content is free (see *e.g.* the Louvre, Box 7). A further possibility is to provide free access but charge commercial re-use of cultural content. However, this supposes that copyright conditions are clearly defined and that there are interested commercial actors (Multimedia World Watch, 2003). With the increasing use of different delivery platforms, there are also opportunities for new services, *e.g.* for mobile phones (OECD, 2005b).

Public funding

Substantial government funding of online cultural projects remains necessary in most cases, despite cost-reduction strategies and new funding sources. The DigiCULT study (2002) estimated that by 2006 at least 85% of funding for institutional Web sites in the EU would remain public. A survey on Canadian projects confirmed this finding, and that funding has to be maintained at least in the mid-term for existing projects (Multimedia World Watch, 2003). Many OECD countries provide funding to cultural and educational content projects. For example, the Finnish government allocated EUR 5 million over five years to digitisation and committed to continuity of funding afterwards (KULDI, 2003). To address the challenge of digital content preservation, in December 2000 the US Congress appropriated USD 100 million for a national digital strategy effort headed by the Library of Congress. Current investments often also improve in-house capacities and support more efficient and cost-effective future digitisation (Wall Communications Inc., 2002), but continuing technological developments require continuing investments.

Born-digital content

An increasing number of projects are dealing with digital preservation. The Internet Archive has to date created a significant collection of historic Web pages and inspired a number of national preservation projects, *e.g.* the Swedish Kulturarw project (see Annex 1, Table A1.2). There are also smaller projects, which focus on specific digital cultural material (*e.g.* 40YEARSVIDEOART.DE). Rhizome.org, a virtual community of interest, has played a significant role in highlighting the importance of this issue and creating a forum for expert discussions. Further, as digital preservation involves various topics ranging from copyright to technological solutions and economic business models, co-operation is specifically useful. For this reason the Network of Expertise in Long-Term Storage of Digital Resources (NESTOR) has been created.

The 2003 UNESCO Charter on the Preservation of Digital Heritage has raised wider international awareness of this issue. It emphasised that: "*Many of these resources have lasting value and significance, and therefore constitute a heritage that should be protected and preserved for current and future generations."* The need for co-operation between hard- and software developers and authors, publishers and distributors with national libraries and archives was also mentioned (UNESCO, 2003). This reflects a growing recognition of the need for co-operation among all stakeholders (Muir and Ayre, 2004). A joint statement by the International Federation of Library Associations and Institutions and the International Publishers Association said that "Libraries have traditionally taken care of the publications they have acquired, and have saved the physical artefact to safeguard the information contained in it. With digital information the safeguarding of the content becomes more of a shared responsibility between the producer and the collector of the information" (IFLA and IPA 2002).

As outlined above technological solutions for low-cost and efficient preservation of born-digital content are not yet available. Ongoing research work addresses the main preservation strategies (migration, technology preservation and emulation), and co-operation between research and preservation institutions and private institutions has been set up in some cases (see Muir and Ayre, 2004).

Preservation increasingly requires continuous action which starts at the moment of creation, but this faces legal copyright difficulties, and it has increasingly been suggested that all institutions have to be involved in preservation and that responsibilities be carefully allocated. Some (*e.g.* publishers) may not have an interest in archiving resources. As a solution a number of policy instruments have been proposed ranging from: *i)* government subsidies for preservation efforts, *ii)* compulsory preservation for owners of materials, and *iii)* requirements of rights transfers to preservation institutions. The measures aim at distributing responsibilities and appropriate incentives across institutions to achieve best possible collective efforts (Lavoie, 2004). Ultimately a "market for preservation" would be created for long-term archiving, which would achieve scale economies and necessary efficiencies.

ANNEX 1. DIGITAL EDUCATION AND CULTURAL PROJECTS AND INSTITUTIONS

Annex Table A1.1. Digital education institutions and projects in OECD countries: selected examples

Country	Name	Purpose
Australia	**Educational Network Australia (EdNA)**[47] Managed by *education.au limited*, a non-profit company owned by the Australian education and training ministries	Two key functions: • A directory of education and training in Australia. • A database of Web-based resources useful for teaching and learning
Australia and New Zealand	**The Le@rning Federation**[48] Part of Backing Australia's Ability: Innovation Action Plan	Supports the development of online curriculum resources, services and applications Commitment of the governments of Australia and New Zealand through the Online Curriculum Content for Australian Schools Initiative to provide AUD 34.1 million over five years (2001-2006)
Austria	**e-Education & e-Training** Part of eFit project of the national bmbwk	Provides electronic learning and teaching material via specific Web portals[49] Project *Neue Medien in der Lehre* (New Media in Education). See Box 13.
Canada	**E-Learning Program** CANARIE with funding support from Industry Canada and Office of Learning Technologies	Goal was to reduce structural barriers to the use of advanced networks in education and training (technology support). 32 projects funded through CAD 29-million programme 1999-2004, with over 265 participating organisations from both private and public sectors
Canada	**Gateway Fund** Canadian Culture Online, Department of Canadian Heritage	Objectives are to: • Augment the amount of quality Canadian cultural content for the Internet;. • Build audiences for that content by *making it easy to find on the Internet*; and • Engage Canadians to use the content and share their perspectives on Canadian events, people and values. Call for proposals targeting the development of online access points that aggregate Canadian cultural content for educational purposes (in the K-12 teaching environment, and the *maternelle* to *secondaire* teaching environment in Quebec)
Czech Republic	**Evaluační Web**[50] Czech Ministry of Education	Web application for educational content evaluations, to encourage schools to purchase quality materials. Contains catalogues of meta-data on instructional materials and makes it possible to classify, search and view the materials including the relevant reviews Teachers may also use Web site to exchange opinions on the instructional materials in terms of their practical use.

Country	Name	Purpose
Denmark	**UNI-C** Public institution under the Danish Ministry of Education	Sector offers a broad spectrum of ICT services for the educational and research community. Provides a common platform for exchange of knowledge and sharing of IT experience
Italy	**CIPE SCUOLA** promoted by the Italian Ministry for Innovation and Technologies in collaboration with the Ministry of Education, University and Research (MIUR)	Main objective is to develop a digital content market by stimulating both the *demand* (school, teachers, students) and the *offer* (content industry and publishers). See Box 15.
Korea	**Adapting ICT into Education Master Plan II 2001 – 2005** (national program of the Korean MOE – HRD)	Various projects related to digital educational content: • Life-long learning initiative to provide a system for online training, electronic lifelong learning resources, and online communities. • Initiative to create online system of educational Programs for the gifted0 • EDUNET (see below). • e-Campus Vision 2007 (see below).
Korea	**e-Campus Vision 2007**	Established in latter half of 2002 as 5-year plan Initiatives starting in 2003: • e-Learning support centres allowing college students to take online courses (151 out of 376 universities in Korea either full or partial e-Learning education) • Government will build and operate 10 university e-Learning support centres in 10 districts to expand university e-Learning infrastructure.
Korea	**EDUNET**	Educational information service system provides comprehensive educational content on line: • Korean "National Educational Resources Sharing System" is the world's largest national system for sharing and distributing education content[51], offered as a service on Integrate Search channel on EDUNET • Data: 15 000 resources available to 5.03 million users in 2003 • Completion of development of nationwide educational information based on standard metadata in May 2002 • Upgraded service, customisable and various services for students, teachers and education community.
Netherlands	**Teleblik Project** Initiative of the Netherlands Institute for Picture and Sound, Teleac/NOT and Kennisnet	Aims to provide audio-visual sources for education
Netherlands	**Kennisnet**	Creates virtual space for learning and educational processes. See Box 10.
Switzerland	Swiss Virtual Campus Programme www.virtualcampus.ch	The main objective of this programme, started in 2000, is the development of ICT-based course modules in university curricula and the promotion of e-learning and online teaching methods at university level. The programme is in its consolidation phase and will be continued until 2007.

Country	Name	Purpose
UK	**Culture Online** UK Department for Culture, Media and Sport	Supports the creation of interactive projects See Box 11.
UK	**BECTA**[52] (British Educational Communications and Technology Agency) Government agency which supports all four UK education departments)	Aims pursued: • Improve learning and teaching through the effective and embedded use of ICT. • Increase the number of educational institutions making effective, innovative and sustainable use of ICT. • Improve the availability and use of high quality educational content. • Develop a coherent, sustainable and dependable ICT infrastructure for education.
UK	**National Grid for Learning** (NGfL) Funded and managed by BECTA	Portal to educational resources on the Internet, launched in November 1998. Provides a network of selected links to Web sites that offer high quality content and information.
UK – England	**National Curriculum Online**[53]	Online access to programmes of study requirement, currently for 12 subjects to high-quality, relevant teaching resources
UK – Scotland	**Scottish Resources Archival Network**[54] Scran Trust – registered charity	Aims to provide educational access to digital materials representing Scottish culture and history Hosts over 300 000 images, movies and sounds from museums, galleries, archives and the media
US	**National Gallery of Art**, **Washington D.C.**	Online resources to connect art and education. Provides online lessons, teaching material, student activities, resources on different arts-related topics to connect art and education[55] (*e.g.* Exploring Themes in American Art,[56] Specific site for children: different games and activities involving arts.[57]
US	**Internet Content for the Classroom** - **MarcoPolo Education Foundation** Non-profit consortium of premier national and international education organisations and the MCI Foundation – philanthropic arm of MCI, the leading global communications company)	First launched in 1997 provides a collection of standards-based, discipline-specific educational Web sites for K-12 teachers; in 2005 more than 17 million user sessions. MarcoPolo features: • Seven content Web sites with lesson plans, student interactive content, downloadable worksheets, links to panel-reviewed Web sites and additional resources created by the nation's leading education organisations (*e.g.* ArtsEdge[58] offers arts-related teaching material in co-operation with the John F. Kennedy Centre for the Performing Arts). • A scalable professional development programme that has registered over 200 000 teachers trained in all 50 states and the District of Columbia by world-class trainers and materials • A network of states' partners dedicated to rolling out MarcoPolo to all teachers and aligning the content to state education standards. • Leading edge diagnostic measurement and technology that enables state-of-the-art tracking and reporting to ensure teachers' Internet integration needs are being met across the country.

Country	Name	Purpose
US	**The Gateway to Educational Materials**[59] Consortium members range from government agencies, both federal and state, to educational institutions, non-profit and commercial organisations	Declared aim is to become world's leading metadata co-operative. Consortium effort to provide educators with quick and easy access to thousands of educational resources found on various federal, state, university, non-profit, and commercial Internet sites. As of May 2004, educators can access over 40 000 records from over 600 Consortium member collections. To insure quality, organisations and individuals who would like to have records for their resources in The Gateway must join the GEM Consortium.
Transnational but mainly US	**MERLOT**[60] (Multimedia Educational Resource for Learning and Online Teaching)	International co-operative of individual members and partners who participate in the continuing creation, expansion, and refinement of MERLOT in order to transform and improve higher education Provides a free and open resource designed primarily for faculty and students of higher education Links to online learning materials are collected along with annotations such as peer reviews and assignments
Transnational Alliance	**Global Learning Objects Brokered Exchange (GLOBE) alliance** Founding members Ariadne Foundation in Europe, Education Network Australia, eduSource Canada, Multimedia Educational Resources for Learning and Online Teaching (MERLOT) in the US and National Institute of Multimedia Education (NIME) in Japan	Announcement of alliance 26 September 2004: Organisations have committed to work collaboratively on a shared vision of ubiquitous access to quality educational content. Aim to provide user access to learning resources across countries and regions. First steps: development of use cases, business rules and technologies to enable search across repositories.
US, Canada, UK	**The Art Museum Image Consortium**[61] (AMICO)	Not-for-profit organisation of institutions with collections of art, collaborating to enable educational use of museum multimedia.
EU	**eTEN**[62] European Community Programme	Aims to help the deployment of electronic services (eServices) with a Trans-European dimension, includes a focus on e-learning Key issues for 2005: deployment of lifelong learning services; services that provide adults with key skills and competencies to improve their employability and at the workplace training; deployment of networked campus and collaborative services.

Source: OECD compilation.

Annex Table A1.2. Digital cultural content institutions, programmes and projects: selected examples

Country	Name	Purpose
Australia	**PictureAustralia**[63]	Internet services allowing search of online pictural collections began in 1998 as a pilot project and following very strong support it expanded into a new service to include more libraries, galleries, museums, and archives. Won an Australian Financial Review 2000 Australian Internet Award in the Arts category, November 2000.
Australia	**Australian Libraries Gateway** National Australian Library	Free Web-based directory service which has improved access to information about more than 5 400 Australian libraries, their collections and services since March 1998.
Australia	**Department of Communications, Information Technology and the Arts**[64] (DCTA)	Responsible for policy and programmes for development, utilisation and integration of new technologies within and across Australia's cultural sector. Main projects (see below): overview portals (CAN) and Culture and Recreation Portal (CARP).
Australia	**Collections Australia Network** (CAN).[65] Joint initiative of the Australian Government and State and Territory Governments in partnership with the Australian cultural sector	Initiated in 2004, the portal is intended to be the public gateway to collecting institutions across Australia including small to medium regional institutions
Australia	**The Culture and Recreation Portal** (CARP)[66] is one of a series of Australian Government customer-focused portals developed under the Government's Online Strategy.	Provides access and search facilities to over 3 500 evaluated Web sites (over 1.8 million pages) from Australian government and non-government cultural and recreation organisations. Promotes access to cultural activities and information relevant to arts and culture and fosters development, utilisation and integration of new technologies by Australia's cultural sector.
Austria	**eCulture** Part of eFit project of the national bmbwk	Aims to support Austrian digital culture See Box 13.
Canada	**Culture.ca: Canada's Cultural Gateway**[67] Initiative of the Department of Canadian Heritage, part of Canadian Culture Online Strategy, a collaborative arrangement between the federal government, the cultural community and the private sector	Provides a knowledge platform to share and exchange high quality information and data on the diversity of culture in Canada.
Canada	**Canadian Culture Online Strategy**[68] Operates with the Cultural Affairs Sector of the Department of Canadian Heritage	Objectives: • To achieve a critical mass of quality cultural content on the Internet in both English and French. • To build a conducive environment for Canada's cultural industries, institutions, communities and creators to produce and make available Canadian cultural content on the Internet. • To increase visibility and build audiences for Canadian digital cultural content. Projects: Research on sustainability and business models for digital cultural content, Culture.ca (see above), supports Virtual Museum of Canada (see below) and the New Media and Gateway Funds (see above)
Canada	**Virtual Museum of Canada**[69] Part of Canadian Culture Online Strategy	Provides interactive tools and games, personalisation, images, section Learning with Museums, online educational tools to exploit learning potential of museums.

Country	Name	Purpose
Canada	**Telefilm Canada** Federal cultural agency reporting to the Department of Canadian Heritage	Dedicated to development and promotion of Canadian film, television, new media and music industries Supports creation of new media products that reflect Canadian society with the objective of building larger audiences for Canadian cultural products
Canada	**Applied Research in Interactive Media (ARIM)** Department of Canadian Heritage and CANARIE[70]	Aims to research, develop and create the tools that enrich the user experience. Collaboration among artists, writers, educators, scientists, private businesses, and all levels of government to use broadband networks in new and creative ways for content delivery Projects funded *e.g.* multimedia musical education.[71]
Czech Republic	**Manuscriptorium Project**[72] Funding for digitisation provided by Ministry of Culture, launched in co-operation with The National Library	Aims to digitise and provide access to historical documents, and also to bibliographical documents.
Denmark	**DAISY (Danish Archival Information System)**	To make the holdings of The Danish State Archives more accessible to the public by making it possible for researchers, students, genealogists and other users to seek information about the holdings via the Internet. By end of 2005 Daisy will contain information about almost 40% of holdings, and by end of 2008 this is expected to be at least 70% (holdings of the Danish State Archives are about 335 000 running shelf-metres of archival records, or approximately 3 million boxes). Ongoing process to improve Web site search facilities.
Denmark	**DanmarksDebatten (Denmark's Debates)** Provided by the National IT and Telecom Agency	Danmarksdebatten is a dialogue-oriented Internet-based tool for input from citizens and elected representatives. More than 100 authorities registered today as users of the debate module, more than 10 000 unique visitors a year on the nationwide page.
Denmark	**Bibliotekernes Netmusik**[73]	Service allowing libraries to offer their users music loans directly to their home computer over the Internet, approximately 113 000 tracks for download Project based on an agreement made between a consortium of public libraries in Denmark, "Bibliotekskonsortiet", and the company Phonofile. Music originates from digitisation of Danish CDs by State and University Library in Aarhus and delivered by participating record companies. About half of public libraries participate in the project.
Denmark	**Denmark's Electronic Research Library (DEFF)** Organisational and technological partnership between research libraries co-financed by the Ministry of Science, Technology and Innovation, the Ministry of Culture, and The Ministry of Education	Aims to advance the development of a network of electronic research libraries. Supports a common access system that allows all Danish researchers and students in higher education to access licensed digital information from home. Joint negotiation, purchase and administration of licensed digital information resources to further education and research including online music. Development of subject-based gateways to information, or portals, *e.g.* Business Economic Portals, Online Music Research Library Portal.

Country	Name	Purpose
Denmark	**Litteratursiden**[74] Co-production by 55 municipal public libraries	Provides information on Danish literature including recommendations, literature lists, themes, articles, analyses, author portraits, interviews.
Denmark	**Regin** Initiated by the Danish National Cultural Heritage Agency	Aims to provide Danish museums (primarily museums of cultural history) with access to a modern collections' management system. Registration of items in the system is required to conform to Danish Museums' Documentation Standard → collections are immediately accessible over the Internet to other museums, researchers, and anyone with an Internet connection. In August 2005 80 museums are connected to the system, public Internet-client scheduled to open in September 2005. Art Index Denmark: follow-up project to provide similar solutions for Danish art museums.
France	**ARCNAT**[75] French Ministry of Culture and Communication	Web portal providing information on archaeological sites and historical monuments; over 10 sites in France and three abroad. Includes interactive virtual tours and also some educational focus.
France	**Gallica**[76] French National Library (BnF)	Multimedia resources cover period from the Middle Ages to the early 20th century including reference material, rare editions, dictionaries, journals and images, thematic collections focusing on French cultural content Database provides free access to 70 000 printed volumes in image mode (monographs and periodicals), 1 250 printed documents digitised in text mode, 80 000 fixed images and several hours of sound recordings. Annual budget of USD 1.35 million for book scanning (Riding, 2005), no restrictions on copyright, documents may be consulted or downloaded for private use.
France	**IRCAM Forum**[77] Institut de Recherche et Coordination Acoustique/Musique	Musical institute – Centre Pompidou: mission to bring together scientists and musicians for joint artistic creation Provides a forum for more than 1 200 professionals using IRCAM software. Offers chat lists, downloadable upgrades, software, documentation and links to interesting sites provided by community of researchers, composers, performers, students, software and documentation.
France	**The Louvre**[78]	Museum's Web site is a multimedia portal giving various forms of access to cultural material. Web site "louvre.edu" educational virtual environment service. See Box 7.
Germany	**NESTOR**[79] (Network of Expertise in Long-Term Storage of Digital Resources)	Objective is to create a network of expertise in long-term digital preservation for Germany. Project includes a Web-based information forum, recommendations for certification procedures of digital repositories, recommendations for collecting guidelines and selection criteria for digital resources to be archived and guidelines for the long-term preservation of digital resources.

Country	Name	Purpose
Germany	**40JAHREVIDEOKUNST.DE**[80] (40YEARSVIDEOART.DE)	Digital preservation of German video art from 1963 to the present. Aims to develop techniques and case studies for the preservation of videotape, magnetic tape of video art pieces degenerated with time including the exemplary and systematic restoration of selected videotapes.
Hungary	**John von Neumann Digital Library and Multimedia Centre**[81]	Library provides freely accessible collections containing tens of thousands of Hungarian texts from public collections. Ongoing digitisation of fictions, technical literature and works of science history.
Italy	**Internet Culturale**[82] service based on the *Servizio Bibliotecario Nazionale* - SBN (National Library Service), a network managed by the Italian Ministry of Cultural Heritage in co-operation with regions and universities	Portal launched in March 2005, was developed in the framework of the Italian Digital Library and the Cultural Tourism Network initiatives. Provides users with access to the catalogues of 2 300 Italian libraries – offering a total of about 15 million documents – through a single, integrated platform. Offers search options, information on document availability, information on library, reservation possibilities.
Netherlands	**Occasio Digital Social History Archive**[83] International Institute of Social History	Collection of newsgroup messages on social, political and ecological issues distributed on the Internet. Aim was to preserve important social and political digital documents and to make them accessible to historians and social scientists.
Japan	**Validation Experiment of Digital Cultural Heritage Archives**	Research experiment dealing with metadata. See Box 12.
Sweden	**Kulturarw**[384]- Long-term preservation of electronic documents The Royal Library - National Library of Sweden	Aims to archive all Swedish Web sites. - 12 sweeps across the Internet until February 2005, 9 895 gigabytes and 347 647 Web sites preserved on magnetic tape (February 2005) - No attempt is made to select Web pages but rather technology is used to save all - Archive opened for public access at Royal Library premises.
Switzerland	**e-Helvetica**[85] Project of the Swiss National Library	Aims to establish a digital archive to preserve electronic publications well into the future. Development of a framework for the collection, cataloguing, retrieval and preservation. The library considers the data carrier and system environment in addition to retaining the information *per se* when archiving electronic publications. Duration of the project is estimated at six years (2001-2006) expected to run until 2008.
UK	**BBC Creative Archive** British Broadcasting Corporation (BBC)	Allows download of clips of radio and TV programs for non-commercial use from the BBC Web site, launched in autumn 2004. Files can be stored, manipulated and shared also to contribute to “digital creativity”. Plans to release sport, music and drama and longer formats at later stage.
UK	**Cornucopia**[86] Managed by the Museums, Libraries and Archives Council	Online database of information about more than 6 000 collections in the UK's museums, galleries, archives and libraries.

Country	Name	Purpose
UK	**JISIC**[87] Funded from the UK further and higher education funding councils	Works with further and higher education by providing strategic guidance, advice and opportunities to use ICT to support teaching, learning, research and administration. Funds projects on topics such as metadata, networking, ICT, content creation, content access, training, teaching and learning technologies.[88]
US	**National Digital Information Infrastructure and Preservation Program**[89] Library of Congress funded by the US Congress	Aims to develop a national strategy to collect, archive and preserve digital content, especially materials that are created only in digital formats, for current and future generations.
US	**MetaArchive Project**[90] Collaborative venture of Emory University, Georgia Tech, Virginia Tech, Florida State University, Auburn University, University of Louisville, and the Library of Congress	Three-year process to develop a co-operative for the preservation of at-risk digital content with a particular content focus: the culture and history of the American South. Projects: *i)* a prioritised conspectus of at-risk digital content in this subject domain held at the partner sites, *ii)* a harvested body of the most critical content at the partner sites to be preserved, *iii)* a cooperative agreement for ongoing collaboration, and *iv)* a distributed preservation network infrastructure based on the LOCKSS software.
US	**Internet Archive**[91] non-profit organisation	Aims to preserve content distributed on the Internet - Founded in 1996, by 2003 it had developed the largest collection of Web pages in the world with about 10 billion Web pages - "*Wayback Machine*" holds 40 billion pages from 50 million sites (approx. 1 petabyte of data and growing at a rate of 20 terabytes per month) and allows to revisit preserved historic Web pages (it is necessary to include specific URL and a date range) - Archived include texts, audio, moving images, software apart from archived web-pages
G7 proposal (network of 14 national libraries)	**Bibliotheca Universalis**[92] Pilot project of the Global Information Society programme Partners: National Libraries of Australia, Belgium, Czech Republic, Canada, France Germany, Italy, Japan, Netherlands, Portugal, Spain, Switzerland, UK, US	Aims was to benefit from joining individual national efforts at creating digital libraries Main objectives: *i)* exchange of information and experience, *ii)* co-ordinate efforts of the partners within an international cooperation framework as regards digitisation policies, exchanging information and sharing experiences, and *iii)* implementation of interoperability protocols to facilitate public online access to all collections
EU	**Celebrate**[93] (Context E-LEarning with BRoAdband TEchnologies) European Framework 5 project co-ordinated by European Schoolnet and supported by the European Commission's Information Society Technologies Programme (IST)	A 30-month demonstration project (ended in Nov. 2004) Involved 23 participants including Ministries of Education, universities, leading educational publishers, content developers, VLE vendors and technology suppliers from 11 countries Approximately 1 400 Learning Objects, 2 400 Learning Assets were developed and made available to over 300 selected primary and secondary schools

Country	Name	Purpose
EU	**Cipher**[94] (Enabling Communities of Interest to Promote Heritage of European Regions) Partners: The Open University, UK, Dublin Institute of Technology, Ireland; University of Art and Design, Helsinki, Finland; The Discovery Programme, Ireland; Czech Technical University, Czech Republic; *Internet-Lösungen* und Dienstleistungen RiS GmbH, Austria	Project launched by EU - from April 2002 to September 2004. Aimed at encouraging public participation in heritage through the development of Cultural Heritage (CH) Forums to explore, research and build content Researched the social and technical issues involved, and developed technology and methodology required to realise sustainable cultural Heritage Forums. Four CH Forums produced were organised around: *i)* Irish cultural and national heritage, *ii)* Nordic heritage through storytelling and historical artifacts, *iii)* the shared heritage of central Europe, and *iv)* the tradition of technology innovation in south central England.
EU	**i2010: Digital Libraries** Initiative of the European Commission	Aims at making European information resources easier and more interesting to use on the Internet. Main points of focus: *i)* online accessibility, *ii)* digitisation of analogue collections, *iii)* preservation and storage (EC, 2005b).
EU	**The European Library (TEL)**[95] Co-operative project of eight European national libraries along with ICCU, the Italian central cataloguing institution, established under the aegis of the Conference of European National Librarians (CENL)	Service launched in March 2005, which provides resource discovery facilities and offers integrated access to the collections of the national libraries of Europe. Covers 11 million records and digitised objects and items. Discussions with Google for best incorporation of The European Library in search engine
EU	**MINERVA**[96]	Network of EU Member States' Ministries to discuss, correlate and harmonise activities carried out in digitisation of cultural and scientific content for creating an agreed European common platform, recommendations and guidelines about digitisation, metadata, long-term accessibility and preservation
UNESCO	**DigiArts - UNESCO Knowledge Portal**[97]	Aims of the project include to: • Disseminate historical, theoretical, artistic, technical and scientific research in the field of electronic and digital arts. • Promote information exchange and communication among artists, scientists and technicians from different geo-cultural regions. • Support existing institutions and networks throughout the world in the transfer of knowledge.
International	**Google Print's "Library Project"**	Aims to make library collections searchable by including books and periodicals into its search index Investment of USD 200 million to be able (and allowed) to digitise approximately 15 million books over one decade (Riding, 2005) Project started end of 2004 and agreements with various major libraries have been reached (New York Public Library, libraries of Harvard University, Stanford University, University of Oxford, University of Michigan)

Source: OECD compilation.

Annex Table A1.3. Main digital archives owned by government ministries and agencies in Japan

Name	Ministries and agencies	Archived data	Web site URL
1. Archives of arts and cultural properties			
e-National Treasure	National Museums	127 national treasures (released from fiscal 2002)	http://www.emuseum.jp/
Cultural Digital Library	Ministry of Education, Culture, Sports, Science and Technology (MEXT)	High-resolution digital image data of about 1 600 pairs of colour prints (available in JPEG), image data of about 5 500 bromides (available in JPEG), documentary photography of about 1 350 performances including performances of Shin-Kabuki, Bungaku, traditional dancing/music, Nou/Kyogen, etc.	http://www2.ntj.jac.go.jp/dglib/
Asian Historical Record Database	Japan Center for Asian Historical Records, National Archives of Japan	Asian historical records of approx. 670 000 items and approx. 10 million digital image data (with DjVu).	http://www.jacar.go.jp
Digital Archive System	National Archives of Japan	Historical government documents and records of approx. 960 000 volumes and catalogue data of approx. 2.4 million items.	http://www.digital.archives.go.jp
2. Archives of government publication materials			
White papers, reports etc	Governmental ministries and agencies	White papers, reports, etc. Available in HTML, GIF, PDF, SGML etc.	Each governmental ministry's or agency's website
Budget documents and closing of accounts documents	Ministry of Finance	Budget documents from 1947-2005, closing of accounts documents from 1947-2003.	http://www1.mof.go.jp/data/index.htm
3. Laws and Acts data			
Laws and Acts Data	Administrative Management Bureau, Ministry of Internal Affairs and Communications	About 1 000 laws and acts including Laws, Government Ordinances, Imperial Ordinances, Ministry Ordinances, Cabinet Office Regulations and statues which were abolished or became substantially ineffective after 1 April 2001 (available in HTML documents).	http://law.e-gov.go.jp
4. Judicial precedents archive			
Law Reports	Supreme Court	Judicial precedents of the Supreme Court and High Courts, administrative suits, labour laws, intellectual property rights, and lower courts.	http://courtdomino2.courts.go.jp/home.nsf
Database of Decisions	Japan Fair Trade Commission	About 2 200 cases as of January 2005 (available as PDF or HTML documents).	http://snk.jftc.go.jp
5. Statistical archives			
Portal Site of Statistical Data in Japan	Statistics Bureau, MIC	Relational Database (about 7 000 statistical tables), about 800 registered statistical surveys with guidance, etc.	http://portal.stat.go.jp

Name	Ministries and agencies	Archived data	Web site URL
Geographic Information Systems Plaza of Statistics	Statistics Bureau, MIC	The results of the 2000 Population Census, classified by "*Chocho, and Aza*" (units of small areas) including 186 items	http://gisplaza.stat.go.jp
Website of Statistics Bureau	Statistics Bureau, MIC	The results of statistical surveys (about 40 000 Excel files)	http://www.stat.go.jp/data/index.htm
6. Archive of geographical information			
Spatial Data for National and Regional Planning	National and Regional Planning Bureau, Ministry of Land Infrastructure and Transport (MLIT)	87 items available for download	http://nlftp.mlit.go.jp/ksj/index.html/
Building of National Land with water information	River Bureau, MLIT	River disaster information, databases of quality of river and river environments	http://www3.river.go.jp/IDC/index.html
7. Archive of meteorological information			
Meteorological and seismological data	Japan Meteorological Agency, MLIT	Meteorological data from meteorological observatories (since 1961) and the Automated Meteorological Data Acquisition System (AMeDAS) (since 1976), Seismic Intensity data (since 1926), etc.	http://www.jma.go.jp/jma/index.html
8. Archive of academic and research information			
Science and Technology Information Transmission/ and General Distribution systems	Research Promotion Bureau, MEXT	268 academic journals (abstracts available as HTML documents and full text versions available as PDF documents) (as of February 2004)	http://www.jstage.jst.go.jp/browse/-char/ja
Agropedia (agricultural information / resources system)	Agriculture, Forestry and Fisheries Research Council, Ministry of Agriculture, Forestry and Fisheries (MAFF)	Database system for satellite images concerning agriculture, forestry and fisheries, agricultural studies database, library of research on agriculture, forestry and fisheries, general data inventory of research institutes related to studies of agriculture, forestry, and fisheries, database of research project information, and video libraries	http://www.affrc.go.jp/agropedia/
Database of research result information	Agriculture, Forestry and Fisheries Research Council, MAFF	Results of Research conducted by MAFF-affiliated testing laboratories (approx. 1 7000 items available as HTML documents)	http://www.affrc.go.jp/ja/db/seika/index.html

ANNEX 2: RECOMMENDATIONS FOR DEALING WITH ONLINE CULTURAL CONTENT

Box A2.1 Recommendations for the sustainability of cultural content

The recommendations are the result of a study[98] analysing international business models for the Department of Canadian Heritage and focus on the sustainability of Canada's cultural online content.

1. To reach wide audiences the development of a participative culture should be fostered. The Internet provides a unique opportunity for user participation; this characteristic should be used for cultural content.

2. Beyond general cultural Web portals the development of thematic and participative portals should be encouraged. Thematic web portals provide better possibilities to give visibility to specific issues and their participative aspects allow user validation and encourage participation and community development.

3. It is worthwhile to support existing initiatives. The experience and user base can be made use of.

4. Funds for digitisation and availability of cultural heritage should be rationalised. Given the significant expenses, priorities as to which content are to be digitised and providing conditions for content reuse have to be emphasised.

5. Steps have to be taken to deal with the legal impediments to content reuse. There is a lack of organisation in administration of copyright. A useful initiative would be to develop standard licences for use of rights on content.

6. Projects with diverse yet targeted products and services and those with diverse revenue sources should be a priority. These projects allow more opportunities for reaching audiences and receiving funding.

7. The technical and technological risks associated with making projects available online when they are to be conserved over the long term have to be considered. To remain online, projects must overcome potentially costly technical challenges: maintenance, obsolescence and reuse/transfer.

Source: Multimedia World Watch, 2003.

Box A2.2 Recommendations of DigiCULT (EC, 2002a)

For decision makers of European archives, libraries and museums:

1. Raise the competence in cultural heritage institutions**:** encourage human resources development in the areas of IT and digital management and preservation
2. Co-operation at all levels is key to marketing to new target groups**:** seek partnerships with various other institutions to reduce risk, avoid market failure and waste of resources
3. Improve exploitation of own strengths and competencies
4. Become methodological: formulate clear and transparent organisational digitisation policies

For policy makers at European, national and regional level:

1. Develop a methodological and co-ordinated approach to digitisation: comprehensive digitisation programmes and co-operation with different institutions
2. Support of small cultural and memory institutions and regional cultural heritage initiatives
3. Educational use of cultural heritage should be seen as a key target
4. Take care of and ensure access to born-digital cultural heritage resources
5. Secure access to cultural heritage material for future generations
6. Establish a supportive infrastructure for cultural heritage institutions (slip stream model) for the development of digital products and their management
7. Set up effective co-ordination and dissemination mechanisms for cultural heritage know-how

For the European Commission:

1. Enable small and under-resourced cultural heritage institutions to participate
2. Raise awareness for the potential of cultural heritage in the educational market
3. Raise awareness for the use of standards
4. Future R&D in the following areas:

    - Intelligent user guidance and navigation
    - Digitisation automation and mass storage
    - Long-term preservation of complex digital resources and research related to dynamic digital objects
    - New tools
    - Intelligent Cultural Heritage and Knowledge Technologies

Source: EC (2002).

ANNEX 3. ABBREVIATIONS

3G	Third Generation Networks (UMTS)
BECTA	British Educational Communications and Technology Agency
BMWA	German Federal Ministry of Economics and Labour
bm:bwk	*Bundesministerium für Bildung, Wissenschaft und Kultur* (Austrian Ministry of Education, Science and Culture)
CANARIE	Canadian Network for the Advancement of Research, Industry and Education
D&B	Dun & Bradstreet
DCF	Distribution Content Framework
EC	European Commission
ECOMET	Economic Interest Grouping of the National Meteorological Services
EdNA	Education Network Australia
EMII	European Museums' Information Institute
GIS	Geospatial Information System
GLOBE	Global Learning Objects Brokered Exchange
GVA	Gross Value Added
HDD	Heating Degree Days
IFLA	International Federation of Library Associations
IFTS	Information Fair Trader Scheme
ICT	Information and Communication Technologies
IPR	Intellectual Property Rights
ISO	International Organization for Standardization
LBS	Location Based Services
MERLOT	Multimedia Educational Resource for Learning and Online Teaching
MOE – HRD	Korean Ministry of Education & Human Resources Development
NAICS	North American Industry Classification System
NDIIPP	National Digital Information Infrastructure and Preservation Program
NGI - IGN	*Nationaal Geografisch Instituut*/Institut Geographique National of Belgium
NMS	National Meteorological Service
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service (US)
OGC	Open Geospatial Consortium
OMB	Office of Management and Budget
OS	Ordnance Survey
PPP	Public Private Partnership
PRIMET	Association of Private Meteorological Services
PSI	Public Sector Information
SDI	Spatial Data Infrastructure
SEC	Securities and Exchange Commission
WMO	Word Meteorological Organisation

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NOTES

[1] For example, the EC directive on the re-use of public sector information (2003/98/EC, 17 November 2003) has excluded cultural and educational institutions at this stage.

[2] For example, the United States has adopted an open access approach and much PSI is freely available.

[3] In the following the term "cultural content" will be used to include also educational content.

[4] http://europa.eu.int/information_society/policy/psi/index_en.htm.

[5] See OECD (2005b) for detailed analysis of mobile content.

[6] Often the value of PSI lies in the availability of high quality historic data and time series.

[7] The survey applied a value-added approach to estimate the economic contribution; it took into account the impact of OS as a producer of intermediate and final goods/ services and also as a purchaser of raw material from suppliers. The original estimates were GBP 79-136 billion gross value added (GVA) corresponding to 12-20% of total GVA.

[8] See http://inspire.jrc.it/

[9] OECD (2001), Environmental Information in OECD Countries: Progress and Challenges, ENV/EPOC/SE(2001)1.

[10] The development of powerful atmospheric computer models by the NMS's has increased quality.

[11] Each NMS can now offer forecast services outside its own national boundary.

[12] E˙g. to purchase RADAR and METOSAT imagery in the United Kingdom.

[13] Statistical Office of the European Communities Web site.

[14] Tax, Accounting & Legal, Legal Tax & Regulatory Europe, Wolters Kluwer Annual Report 2004.

[15] Thomson Corporation Annual Report 2004.

[16] Annual Report 2004 Reed Elsevier.

[17] Metadata is information on the data itself such as description of content, format, copyright and language.

[18] Ontologies serve to make metadata "understandable" by computers as they define the way descriptive terms are interrelated and used (European Commission, 2004).

[19] http://www.bbc.co.uk/dna/ww2

[20] There is some evidence of the value of these new tools. For example, the Canadian network-based E-Learning Program appears to be very effective (Rossiter, 2005), and simulations create work environments for learning purposes and improve professional training.

[21] http://www.cordis.lu/ist.

[22] Appendix XI.3 (pp. 286-310)

[23] Starting in 2001, the Library of Congress has engaged in extensive planning as part of the National Digital Information Infrastructure and Preservation Program (NDIIPP). The program was created by the US Congress in December 2000 under Public Law 106-554, it gives the Library of Congress the lead in national planning for long-term preservation of digital content working collaboratively with other federal, research, library, and business organisations (Beagrie, 2003).

[24] An emulator is software that works on a new computer but imitates the old computer to access content.

[25] As an example, in Finland in 2003 about 20% of museum collections, 80% of art collections, 10% of natural history collections had been catalogued electronically. Considerably smaller amounts of content were digitised. Given costs and the amount of content, the aim was to digitise the foremost cultural content by 2010 (KULDI, 2003).

[26] Copyright and Licensing for Digital Preservation Project.

[27] Born-digital material may be defined as content which was created using ICTs and those technologies are necessary to access it.

[28] "The rate at which Web sites are shut down and data destroyed indicates how little the budding Internet industry values its history" (Multimedia World Watch, 2003).

[29] See http://www.firstgov.gov.

[30] http://www.videnskabsministeriet.dk/fsk/publ/2004/usingit/html/full_publication.htm

[31] http://www.e-geo.ch

[32] http://inspire.jrc.it/home.html

[33] This includes the OMB Circular No. A-13061 FR 6425 (1996), the UNESCO (2004) Policy Guidelines for the Development and Promotion of Governmental Public Domain Information, the EC Directive on the re-use of Public Sector Information, and the suggestions by Burkert and Weiss (2004).

[34] National Research Council (2001), *Resolving Conflicts Arising from the Privatisation of Environmental Data*, Committee on Geophysical and Environmental Data. Board on Earth Sciences and Resources. Division on Earth and Life Studies, Washington, DC: National Academy Press.

[35] Examples are Dun & Bradstreet for corporate information or Weathernews for meteorological data.

[36] http://europa.eu.int/information_society/activities/econtentplus/index_en.htm

[37] http://www.minervaeurope.org/structure/workinggroups/goodpract/document/bestpracticehandbookv1_2. pdf

[38] See Multimedia World Watch (2003) for details .

[39] The Universal Service Program is administered by the Schools and Libraries Division (SLD) of the Universal Service Administrative Company (USAC). This not-for-profit corporation was appointed by the Federal Communications Commission (FCC) to ensure that the benefits of telecommunications services reach students and communities across the US.

[40] http://www.bettawards.co.uk/

[41] According to Rossiter (2005) the director of the e-Learning Programme, open source approaches will become more predominant as they allow innovation and lower costs"

[42] "In order for Member States to identify and implement strategies and agreements on content production, quality, discovery and use, a number of current and emerging technical issues need to be addressed through short and longer term RTD initiatives. The Commission should: […] counter the risks of creating a 'digital dark ages' by developing advanced research agendas into: digital technologies and preservation of content; improved applications of advanced technologies for digitisation of cultural and scientific content (e.g. multi spectral imaging), adding value to the significance of the content over time. This work should be carried out in close collaboration with industry."

[43] http://www.cordis.lu/ist/

[44] http://w3.tii.se/en/research.asp

[45] Australia,. Austria, Belgium, Canada, Finland, France, Germany, Italy, Japan, Korea, Netherlands, Spain, the US.

[46] For instance, Connexions Repository (Rice University course material – http://cnx.rice.edu/content), Berklee Shares (music lessons), Prelinger Archives (provides more than 1 000 public domain films)

[47] http://www.edna.edu.au/edna/page1.html

[48] http://www.thelearningfederation.edu.au/tlf2/

[49] http//:www.bildung.at and http://www.schule.at

[50] http://web26.e-gram.cz.

[51] Information based on MOE-HRD (2003).

[52] http://www.becta.org.uk/

[53] http://www.nc.uk.net/home.html

[54] http://www.scran.ac.uk

[55] http://www.nga.gov/education/classroom/

[56] http://www.nga.gov/education/american/aasplash.htm

[57] http://www.nga.gov/kids/

[58] http://artsedge.kennedy-center.org/

[59] http://search.thegateway.org/#782777615

[60] http://www.merlot.org/Home.po

[61] http://www.amico.org/

[62] http://europa.eu.int/information_society/activities/eten/index_en.htm

[63] http://www.pictureaustralia.org

[64] http://www.dcita.gov.au/arts

[65] http://www.collectionsaustralia.net/

[66] http://www.cultureandrecreation.gov.au

[67] http://www.culture.ca

[68] http://www.pch.gc.ca/progs/pcce-ccop/index_e.cfm

[69] http://www.virtualmuseum.ca/English/index_flash.html

[70] Canadian Network for the Advancement of Research, Industry and Education

[71] http://www.canarie.ca/funding/arim/projects.html

[72] http://www.memoria.cz/site_en/index.asp

[73] www.bibliotekernesnetmusik.dk

[74] www.litteratursiden.dk

[75] http://www.culture.gouv.fr/culture/arcnat/fr/

[76] http://gallica.bnf.fr/

[77] http://www.forum.ircam.fr/

[78] http://www.louvre.fr

[79] http://www.langzeitarchivierung.de/index.php

[80] http://www.40jahrevideokunst.de/main.php?p=2&n1=1

[81] http://www.neumann-haz.hu/index_en.html

[82] http://www.internetculturale.it/

[83] http://www.iisg.nl/occasio/

[84] http://www.kb.se/kw3/ENG/

[85] http://www.e-helvetica.admin.ch/eng/eng_index.htm

[86] http://www.cornucopia.org.uk/

87 http://www.jisic.ac.uk

88 E.g. technical advisory services TASI for digital images (http://www.tasi.ac.uk).

89 http://www.digitalpreservation.gov/

90 http://www.metaarchive.org/index.html

91 http://www.archive.org/

92 http://www.kb.nl/gabriel/bibliotheca-universalis/en/bibliotheca_universalis_accueil.htm

93 http://celebrate.eun.org/eun.org2/eun/en/index_celebrate.cfm

94 http://cipherweb.open.ac.uk/news/index.pl

95 http://www.europeanlibrary.org/ and the information access web portal address: http://www.theeuropeanlibrary.org/portal/index.htm

96 http://www.minervaeurope.org/

97 http://portal.unesco.org/culture/en/ev.php URL_ID=1391&URL_DO=DO_TOPIC&URL_SECTION=201.html

98 The study "is based on an exhaustive literature review and eighteen interviews conducted all over the globe with professionals in cultural and Web-related fields representing mainly cultural institutions, government departments, Web producers/publishers, broadcasters, new media artists, and intermediaries from the cultural sector" (Multimedia World Watch, 2003).