Vision 2020

"Networked and Electronic Media"

European Technology Platform

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'Social networks and user generated content are among the current boosters of the economy of the internet. Mobility will further contribute to the emergence of new business models. The relations between these innovative offers and traditional offers such as the press, the music and the audiovisual industry are confrontational in Europe and'[1] ....

'The Internet has the potential to affect almost every aspect of our lives – how we communicate with each other, where we work, how we educate our children, how we entertain ourselves and how we receive our healthcare.'[2]

[1] **Viviane Reding, Member of the European Commission responsible for Information Society and Media, at OECD Ministerial Meeting "Future of the Internet Economy",Seoul, Korea, 17-18 June 2008,** http://www.oecd.org/dataoecd/37/40/40972025.pdf)

[2] **Kevin Martin, U.S. Federal Communications Commission, at OECD Ministerial Meeting "Future of the Internet Economy", Seoul, Korea, June 17, 2008.**

1 INTRODUCTION

The main objective of the Networked and Electronic Media (NEM) European Technology Platform is to foster and promote a consistent European approach to:

- the convergence of media, telecommunication and information technologies (IT), and
- the development and introduction of novel audiovisual and multimedia broadband services and applications.

NEM represents the existing and new technologies across all ICT sectors, including broadband, mobile and new media, to create a new and exciting era of advanced personalised services to benefit European citizens and enterprises.

The focus of NEM is on innovative services delivered over a wide variety of complementary access networks (satellite, terrestrial, cable, twisted pairs, optical fibre, community installations, microwaves infrastructures, etc.) in a seamless and interactive way to a variety of end-user devices, including fixed and handheld terminals. NEM seeks to enhance user experiences by focusing on the levels of enjoyment, trust and value users perceive and on empowering them to create *their* environments for accessing *their* services and content; it is evident that *Accessibility matters!*

NEM is a large-scale industry-led initiative aimed at promoting, directing and accelerating the pace of innovation and the rate of technology evolution to the level that will place European industry at the forefront of the global technology markets and give users an abundance of value-added services and applications to choose from for achieving optimal benefits for all. It represents a broad consensus among European R&D stakeholders to define and realise the ambitions of the European Union 7th Framework Programme; NEM supports the renewed Lisbon Strategy (aligned with the i2010 Initiative) for a competitive, knowledge-based society, and works towards implementation of the post-i2010 vision.

The NEM platform includes more than 600 participants. Its constituency includes all organisations working in the area, including content providers, broadcasters, network equipment manufacturers, networks and service providers, academia, standardisation bodies and government institutions. A significant number of NEM participants are Small and Medium Enterprises (SMEs). NEM is governed by a Steering Board composed of 39 members (in alphabetical order):

Aido, Abertis Telecom, Alcatel-Lucent, Atos-Origin, BBC, British Telecom, Engineering Ingeneria Informatica Spa, Ericsson, Eurescom, European Broadcast Union, France Télécom, GET, GAME, GWT-TUD, Hewlett-Packard, Homega Research, Huawei, INRIA, Intel, Intracom, IRT, Nokia, Philips,

Portugal Telecom Inovacao, Queen Mary University of London, Rose Vision, Siemens, StMicroelectronics, Swissmedia, TDF, Telecom Italia, Telefónica, TeliaSonera, Thomson, Universidad Politécnica de Madrid, University of Amsterdam, Waterford Institute of Technology, CELTIC, Pôle de Compétivité "Images & Réseaux".

They produce a common Vision and a Strategic Research Agenda, as well as position papers in order to accelerate the development of the NEM sector in a harmonised and fruitful way, and place European industry at the forefront of the information era.

The NEM Vision2020 provides the focus for tuning the research priorities for the medium and long term. Given the highly evolving scenario of the digital future, NEM updates yearly its main high level goals for NEM extrapolating from current trends and amenable to repositioning towards societal and economic developments.

2 NETWORKED MEDIA: AN EVOLVING LANDSCAPE

The Media "revolution" is in full progress. Integrated complex systems, rather than single technologies, are the key enablers for growth in both business and social domains. The ICT business strategies needed to deliver these systems are more complex and, at the business case stage, more uncertain than have ever been seen before. As a consequence outcomes have been very difficult to predict, sometimes they are wildly optimistic or far too modest, or completely underestimating the value users ascribe to them and failing to anticipate the speed at which new services can become common place.

Current networks and infrastructures for content and communication will be gradually replaced by the future Internet. NEM technologies are crucial to this future Internet landscape. Changing demographics, changing lifestyles, demanding educated consumers, media literate prosumers, and trends in globalization are driving forces for the exploitation of technological developments. Networked devices and flexible service platforms have emerged as new R&D drivers. These changes affect the context and scope for R&D in the NEM domain dramatically.

The major challenge that the NEM domain will need to address for 2020 is the dynamic nature of the market, where technology lifecycles and business lifecycles remain incredibly fast; the major opportunity comes from the rate of increase of the overall 'digital universe' which is expected to grow by an order of magnitude on less than years. This explosion in complexity and size of the digital universe is documented[3] and widely cited as forecast data for 2011.

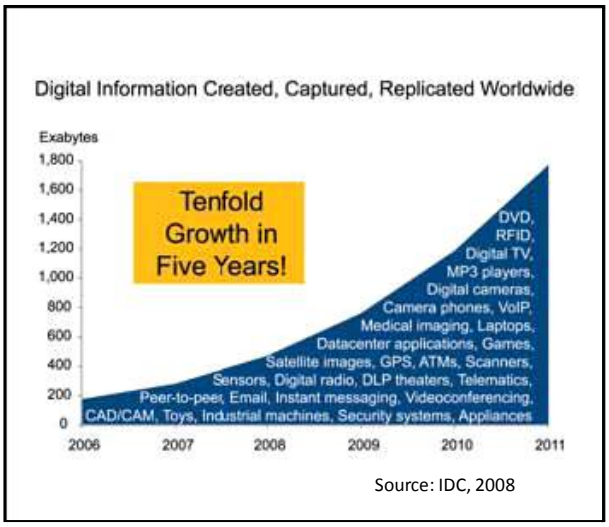


Figure 1: digital information created, captured and replicated worldwide

[3] [IDC White Paper, March2008, updated Forecast of Worldwide Information Growth Through 2011]

Major points and implications from this forecast are:

- **Visual digital universe**

  The digital universe – information that is created, captured and/or replicated in digital form – is predominantly visual (images, camcorder clips, digital TV signals, surveillance streams). Its size is predicted to grow from 281 exabytes in 2007 to 1800 exabytes in 2011 (exa: 10^{18}; still less than Avogadro's number). These numbers are clearly beyond human imagination and certainly so when extrapolated to the year 2020. Figure 1 illustrates this explosion.

- **Physical information overload**

  The storage space and memory that is usable and available in the market is nearly equal to the total amount of information that was being created or captured in 2007, i.e., about 264 exabytes. This balance will not be the case in the future. The gap between the amount of information that is being created and captured and the available storage capacity will grow exponentially from 0 to a predicted 1000 exabytes in 2011. Another extrapolation to 2020 results in dramatic unimaginable figures.

- **Storage consumption**

  The growth of storage consumption was underestimated by 10% for the period 2007-2010. The main factors for this underestimate were the consumer needs for protection of personal data information (preservation of information heritage), carrying around their storage in mobile devices, and the integration of local storage and access to networked storage that is needed for mobility and global access.

- **Diversity**

  6% of the digital universe in 2007 contained 99% of the information units, while 94% contains opaque and unstructured content. This implies that searching for meaning and managing these databases will become a nightmare, not to mention the cognitive overload that people need to cope with.

  Enterprises are faced with a dilemma: More than 70% of the digital universe is created, captured or replicated by individuals, while enterprises are responsible and liable for 85% of this volume with regard to security, privacy protection, copyright protection, screening, fraud detection, etc.

- **Industry distribution**

  The distribution between information processing and impact on the digital universe varies widely amongst industries. For example, the financial services industry accounts for 6% of the worldwide gross economic output with a share of 6% of the digital universe, while the broadcast, media and entertainment industries account for 4% of the worldwide gross economic output with a share of 50% of the digital universe. Another illustrative example is provided by the 100 million daily video streams of YouTube that account for almost as much as all of medical imaging.

- **Complexity – simplicity trade-off**

  The quality of the user experience, the perceived simplicity of accessing and interacting with systems and services, and the effective and acceptable hiding of the complexity of underlying technologies are determining factors for success or failure of novel services, as well as graceful degradation.

> ***'What information consumes is rather obvious: it consumes the attention of its recipients. Hence a wealth of information creates a poverty of attention, and a need to allocate that attention efficiently among the overabundance of information sources that might consume it. (p40-41[4])***

These developments imply two major aspects that need to be taken into account at a very high level:

- **Technology level: A dissipation of the digital universe has to be envisaged. In other words, finding ways for timing and throwing away information, instead of storing all that is created and handling the crashing Internet. Rapidly changing economic situations and fast emerging global environmental threads provide unforeseen challenges and opportunities for NEM technologies.**
- **Human level: A recognition that whilst technology and industry may change rapidly, the fundamental needs of people are constant; they include the basic social and emotional needs for communication and being connected and the need for privacy. Some behavioural and life-style patterns are changing and people will expect ICT to deliver liberation from spatial inhibitors and solutions that will satisfy physical, social and cognitive, as well as societal needs. Fast emerging global nomads and social networks are exemplary.**

Producing and maintaining spaces of sociality, that are enabled by a complex intersection of face-to-face interaction and mediated communication, co-presence and virtual proximity, physical travel and

[4] H. Simon in Computers, Communications and the Public Interest, pages 40-41, Martin Greenberger, ed., The Johns Hopkins Press, 1971

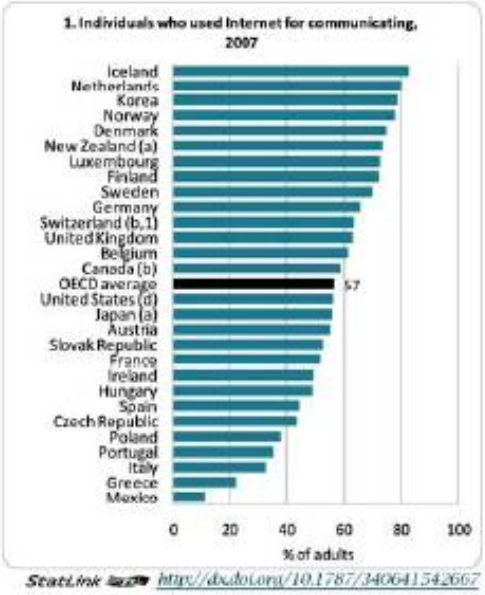
virtual mobility, provide challenges that are beyond imagination. Personal communities become a mobile phenomenon, re-localized in a plurality of online and offline social spaces. These network relationships are reshaped and mobilized through reconfigurations of co-presence, proximity and distance in relation to the use of new media.

Societal changes; the ageing population in the developed world and the growing population in the developing world cause huge gaps in literacy, accessibility, affordability and ability for ICT technologies. NEM technologies will play a crucial role in bridging these digital gaps. To achieve e-Inclusion for all[5], including the ageing population as well as marginalised young people and other groups of people that are at risk of exclusion, is an indispensible and essential condition for the NEM Vision2020. Table 1 is just one example illustrating these behavioural changes that contribute to all-inclusion as well as bear the risk for exclusion.

> *'The Internet is changing our traditional behaviour. Daily activities, such as mailing, telephoning, shopping, banking, playing music and games are increasingly done on line' (p.13 [6])*

Table 1 shows the use of Internet for communicating across the countries of the OECD; 57% of adult users in the OECD countries used Internet for sending e-mails or making telephone calls.

Table 1: Percentages of individuals who are using Internet for communicating in 2007 [7].



[5] For example the Ambient Assisted Living (AAL) programme, http://www.aal-europe.eu/
[6] The Future of the Internet Economy. A statistical profile. OECD, June 2008
[7] The Future of the Internet Economy. A statistical profile. OECD, June 2008

> ***"The internet is everywhere and in everything[8]. The internet unlocks the global wealth of information and knowledge. Its universality allows formerly unconnected people and organisations with similar and diverse interests to find each other, resulting in new and wide-ranging communities of interest, supply chains, and markets and networks – for good and for bad intent"*** **(p13).**

We are currently experiencing phenomenal growth of the internet and innovation in applications, but also with growing risks of failure and their consequences. Problems can accumulate faster than they are being fixed. There has been no significant architectural change to the network core in decades. NEM then is challenged by paving the way for evolving this out-of-date infrastructure into a future internet that still accounts for the installed base and the by now innate needs and requirements of its users.

> ***"Since the 1990s, the internet has changed our life and has transformed our economy. This process will accelerate as the mobile internet and ultra-fast broadband make it possible to deliver innovative services such as eHealth and eLearning everywhere, even in the poorest and most remote communities"[9].***

The term prosumer was coined in 1980 by the futurist Alvin Toffler — in his book, The Third Wave. Prosumers, a blend of producer and consumer are becoming involved in the design and manufacture of products and are helping industry to develop services and products that are more user-centred. The term prosumer is now setting the trend for how companies relate to their customers. In this evolving model, prosumers add value throughout the product lifecycle, from:

- **The "prosuming" of production - prosumers as business process producers,**
- **Pre-market prosumption - identifying demand, design, testing, and defining the benefits,**
- **Marketing - word of mouth, being brand evangelists, blogging, reviewing, and discussing, to**
- **Post market - finding new uses for things people own - hacking, recycling, repairing, sharing.**

How can companies take advantage and what role should they play in, for example, online "prosumer communities," where customers swap tools, tips, and product hacks? These are significant questions that affect the overall NEM value chain.

8 Netherlands Ministry of Economic Affairs: The Internet: a shared future. The Hague, May 2008
9 Viviane Reding, Member of the European Commission responsible for Information Society and Media: Seizing the Opportunities of the Global Internet Economy, Presentation given at OECD Ministerial Meeting "Future of the internet economy", Seoul, Korea, 17-18 June 2008

Our progressive energy consumption and rapidly growing need for sustainability are dramatically affecting the traditional NEM operational landscape. The NEM community is challenged to take a proactive role. For NEM, socially and environmentally sound behaviour contributes to sustained profitable growth and value creation. Some key global trends that are of particular interest for the NEM strategic domain are presented in table 2[10]. These global trends indicate challenges where NEM technologies and applications could pursue advantages with regard to sustainability, energy footprint and people wellbeing.

Table 2: Key global trends

Societal	***Business / Economics***
Growing population in developing world	New and emerging markets
Aging population in developed world	Shift from West to East
Instability/terrorism	Off-shoring/outsourcing
Emerging roles of industries and non-governmental organizations	New business models
Digital divide	New technologies
Privacy	Knowledge management
Rising attention on human rights	IP (infringement, licensing and enforcement)
	Business integrity
	Transparency/accountability
Health	***Environment***
Rising healthcare costs	Climate change
Lack of access to affordable healthcare	Clean air and water
Infectious diseases in developing world	Energy management
Chronic diseases developing world	Limited natural resources
Threat of epidemics (Bird Flu, SARS, etc.)	Cradle-to-cradle
Employee health and safety	Use of chemical substances in products
	Waste management

NEM imagines a future society where NEM technologies will use between 10% and 30% less power than today and where, the application of NEM technologies in other fields of the economy should result in significant reduction of energy demand related to for example, transport and urban structures. This vision is in concordance with the current European[11] and worldwide societal challenges, amongst them, the need to make ICT a contributor for energy efficiency.

[10] (Simpler, stronger, greener. Philips Sustainability Report 2007, www.philips.com/sustainability)
[11] COM (2008) 241: Addressing the challenge of energy efficiency through Information and Communication Technologies

3 CURRENT NEM RESEARCH PRIORITIES

NEM's objective is to foster the development and introduction of novel audiovisual and multimedia broadband services and applications to benefit European citizens and enterprises. The focus of NEM is on providing an innovative mix of various media forms, delivered seamlessly over technologically transparent networks, to improve the quality, enjoyment and value of life. Research priorities for the coming years –short and mid-term- have been identified. They concern research on:

- Digital Content – Design of rich media content by professionals and non-professionals supported by open and standardised tools for content creation, storage, representation, and indexing ensuring interoperability of various content formats, including efficient search and selection engines, utilizing emerging 3D technologies, and creation of new innovative media applications.
- Distributed Media Applications – Realisation of integrated multi-content communications, integration of classical and new media applications, and creation or adaptation of content dedicated to specific user groups, supported by novel open software and tools for integration of multimedia communications applications.
- Future Media Delivery Networks and Network Services – Establishment of autonomous networking and communications architectures, multidimensional network interoperability, universal and seamless service provisioning, Quality of Service and Quality of Experience in future service aware networks for media transport.
- New User Devices and Terminals - Integrated, scalable, and modular multimedia devices and gateways for work and home, portable and mobile devices with auto-configuration and auto-maintenance features and application programming interfaces for new media applications.
- NEM Enabling Technologies – Development of full set of necessary horizontal enabling technologies, providing security, privacy, trust, dependability addressing ethical issues; and ensuring realisation and implementation of NEM research objectives.

In addition to the above high level priorities, NEM will develop technologies and services capable of feeding the creation of the Future Media Internet ecosystem.

As a horizontal target, NEM will develop technologies which will use 10%-30% less energy and because of the high impact of NEM technologies on the saving of energy in other sectors, when NEM services and applications are used, NEM visions a significant increase of NEM technologies across many

sectors of the economy, thus contributing to additional savings on the societal energy demands.

In the European Economic Recovery Plan 2010-2013 three highly strategic Public-Private-Partnerships (PPPs) have been launched: The European Green Cars initiative, the Factories of the Future Initiative and the Energy Efficient Buildings Initiative. Each of these initiatives is considered as a key instrument to foster competitiveness of the European industry. These three initiatives pose research challenges that are very relevant and complementary to the NEM Vision. A close collaboration of NEM with the driving agents defining each PPP is important to achieve a higher impact of the resulting products and services. For example, in the NEM domain of Networking and Delivery Infrastructure:

- Intelligent delivery, quality of services and network architecture can be critical factors to guarantee adequate and advanced traffic management systems and location-based route optimization for the Green Cars initiative. With regard to Energy Efficient Buildings, considerations of home and extended home networks impact the design and efficiency of the new buildings. Finally, for the Factories of the Future the independence of the underlying network infrastructure and the intelligent delivery of services will be critical issues in a demanding production environment.
- Technologies for content creation, manipulation and adaptation are also a relevant subject, especially when considering the main final users of each PPP.

4 NETWORKED AND ELECTRONIC MEDIA: VISION 2020

The NEM Vision2020 provides the focus for tuning the research priorities for the long term and not so near future. Given the difficulties, not to mention, the impossibility of predicting how the digital future will be in 2020, the NEM Vision2020 provides a high level view extrapolated from current trends and amenable to repositioning towards societal and economic developments.

NEM is the cradle for a new business sector at the heart of the Future Media Internet, addressing the challenges posed by evolving global societal trends. This position is reflected in the NEM Vision2020. The NEM Vision2020 is based on contributions of NEM stakeholders and compiled by means of a consensus process.

The NEM 2020 VISION positions:

⇒ An infrastructure of effective and productive ubiquitous, seamless social networks that is people-centric. These networks are easy and efficient to use, accessible when needed, effective and dependable trust worthy. They give people interesting and motivating immersive and sensory experiences. Voice, video and data convergence are handled in a transparent fashion and, when appropriate, in an understandable way for users. Users have access to services whenever they want, anywhere and anyhow.

⇒ A service oriented society in which ambient and context sensitive services are created and provided, personalized and customized to people's individual and social needs, available to communities of users and including ALL citizens.

⇒ Open business models and revenue generating models that anticipate and exploit disruptive innovation patterns that are very flexible and derived from radically changed value chains. A loose network of niche markets, exploitation of the opportunities provided by the 'long tail' of the Zipf distribution, and a multitude of fast moving and operating small enterprises governed by 'soft' regulation and general principles and by specific rights and obligations.

⇒ An increasing role of NEM technologies in many fields of the industry, services and society. NEM technologies have the strength to be used effectively in many diverse applications at several sectors: transportation, health, environment, space, etc. A wider view on synergies exploration among different sectors will prevail on future research and technology developments.