COMMON RESEARCH PRIORITIES BETWEEN RELEVANT ETPs AND THE EECA REGION IN THE FIELD OF CONTENT TECHNOLOGIES AND INFORMATION MANAGEMENT

VERSION 3.1 – DECEMBER 2013

The **PICTURE** project No 288279 is supported by the European Commission under the Cooperation Programme, ICT Theme, of the 7th Framework Programme

PICTURE project identity

Title:	*"**Policy dialogue in ICT to an Upper level for Reinforced EU-EECA Cooperation**" (Contract No 288279)*
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Website:	*http://www.eeca-ict.eu*
Coordinator:	INNO TSD SA, *France, http://www.inno-group.com*
Project Overview:	**PICTURE** is a support action project aimed at supporting policy dialogue between the European Union and Eastern Europe - Central Asia (EECA) countries and at fostering collaboration opportunities with EECA countries organizations in collaborative ICT R&D both under FP7 and under national/regional EECA programs. The main objectives of PICTURE project are: • To enrich and support the policy dialogue between EU and EECA countries, by updating and reinforcing points for convergence of the EU and EECA ICT research and relevant international initiatives and activities; by developing recommendations and roadmap, and by implementing pilot actions and exchanging experience and lessons learnt, • To strengthen strategic partnerships and cooperative research links between European and EECA ICT organizations, e.g., though stronger involvement of IT diaspora and enhancing concrete cooperation initiatives, • To facilitate interactions between EU and EECA ICT communities through organizations of joint events, and facilitate preparation of joint EU-EECA R&D projects.
Consortium:	1. Inno TSD (www.inno-group.com) - France 2. Q-PLAN North Greece Ltd (www.qplanng.gr) - Greece 3. Institute for Informatics and Automation Problems (http://www.sci.am) – Armenia 4. Regional Innovative Technologies Academy (http://www.rita.az) – Azerbaijan 5. Belarusian Institute of System Analysis and Information Support of Scientific and Technical Sphere (http://www.belisa.org.by) – Belarus 6. Georgian Research and Educational Networking Association (http://www.grena.ge) – Georgia 7. National Innovation Fund JSC (http://www.nif.kz) – Kazakhstan 8. The Eurasian Institute of International Relations (http://www.fp7.kg) – Kyrgyzstan 9. Center of International Projects (http://cpi.asm.md) – Moldova 10. The national association of research and educational e-Infrastructures «e-ARENA» (http://e-arena.ru) - Russia 11. Society for Development of Scientific Cooperation (http://www.tajiknip.org) – Tajikistan 12. Scientific Consultant Center "Altyn Umyt" – Turkmenistan 13. Agency of European Innovations (http://cstei.lviv.ua/en) – Ukraine 14. Institute of mathematics under Uzbekistan National University by Mirzo Ulugbek, Ministry of Higher and Secondary Special Education of Uzbekistan - Uzbekistan

Table of Contents

Important notice

This document outlines the PICTURE partners' analysis regarding the common research priorities between selected ETPs (e.g. NESSI and NEM) and the EECA region in the light of HORIZON's 2020 objectives and structure. Initially, this document served as a background document for the Workshop on Content Technologies and Information Management which took place on 24 May 2013 in Kiev, Ukraine. The present revision was based on:

- the outcomes of the above Workshop;
- the analysis of the Work Programmes of the 1st period of HORIZON 2020;
- the Commission staff working document - strategy for European Technology Platforms: ETP 2020 (12.07.2013);
- the updated NESSI's Strategic Research and Innovation Agenda (April 2013);
- the NESSI's Manifesto and Prospectus (June 2013).

1. Introduction

In the EU, the European Technology Platforms (ETPs) constitute state-of-the-art initiatives bringing together the industrial and research communities. In Russia similar structures have already emerged (e.g. Russian Technology Platforms). Some EECA countries exhibit a sufficient degree of maturity for the development of such structures in the foreseeable future. Finally, the other EECA countries can benefit considerably of similar good practices in setting up Technology/Knowledge Platforms (e.g. research agenda development, organisational structuring, etc) since they will further facilitate the process of national research structuring.

The increase of visibility of ETPs among similar structures as well as relevant stakeholders from EECA countries will be mutually beneficial allowing reciprocal learning, sharing experience and possibly joining forces. At the same time, it may also trigger more participation of the private sector in EECA (e.g. innovative companies) in ETPs as well as other similar structures. This could further stimulate the engagement of the private sector of EECA countries in research and innovation and, in return, can provide additional strength to the technology platforms in both regions.

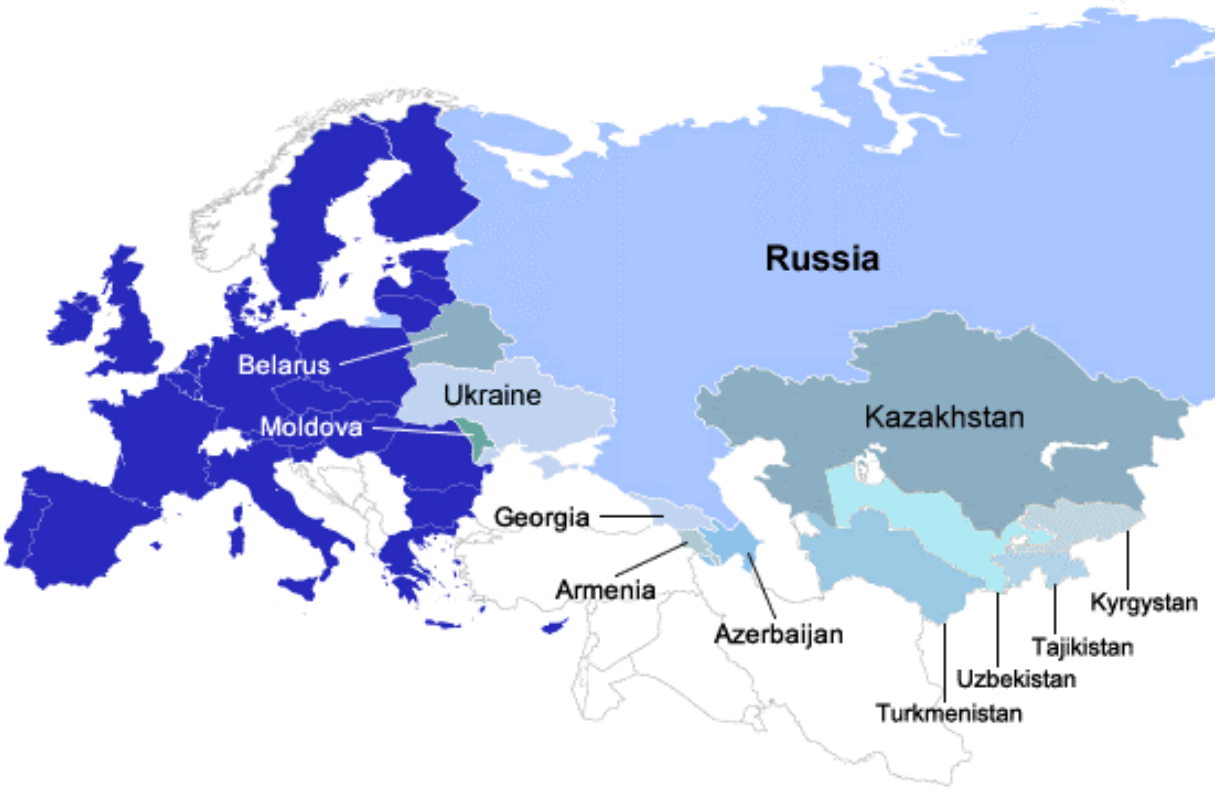
This document, attempts to identify research areas of mutual interest between relevant ETPs and the EECA region in the field of "Content Technologies and Information Management" to become common ground for future joint activities in the light of HORIZON 2020. The document is based on:

- the Strategic Research Agendas and relevant documents of the selected ETPs (i.e. **Networked European Software and Service Initiative - NESSI** and **Networked and Electronic Media - NEM**);
- the Commission staff working document - strategy for European Technology Platforms: ETP 2020 (12.07.2013);
- the current EECA ICT priorities as they were outlined in PICTURE project deliverable: "Updated report about the EECA ICT priorities";
- Horizon 2020 objectives, structure and WorkProgrammes.

REMARK

For a more comprehensive analysis, the Eastern Europe and Central Asia region (EECA region) is divided into three sub regions based on common ICT R&D features:

- **Eastern Partnership (EaP)** countries consisting of: Ukraine, Belarus, Moldova, Georgia, Armenia and Azerbaijan;
- **Central Asia (CA)** countries consisting of: Kazakhstan, Turkmenistan, Uzbekistan, Tajikistan and Kyrgyzstan;
- **Russian Federation**.



2. ETPs

European Technology Platforms (ETPs) are industry-led stakeholder fora that develop short to long-term research and innovation agendas and roadmaps for action at EU and national level to be supported by both private and public funding.

ETPs were established in 2003 after the European Council called for a strengthening of the European Research Area by "…creating European Technology Platforms (ETPs) bringing together technological know-how, industry, regulators and financial institutions to develop a strategic agenda for leading technologies".

Recently, the Commission published a document (COMMISSION STAFF WORKING DOCUMENT - STRATEGY FOR EUROPEAN TECHNOLOGY PLATFORMS: ETP 2020) that sets a new landscape for ETPs. The above strategy:

- seeks to maximize the impact of the European Technology Platforms (ETPs);
- recognises the role of ETPs as part of the external advice and societal engagement needed to implement Horizon 2020;
- sets criteria for the recognition of the ETPs by the Commission.

Additionally, according to the above strategy, ETPs will be a key element in the European innovation ecosystem and will help turn Europe into an Innovation Union, by taking a holistic view and:

- developing strategies and provide a coherent business-focused analysis of research and innovation bottlenecks and opportunities related to societal challenges and industrial leadership actions;
- mobilising industry and other stakeholders within the EU to work in partnership and deliver on agreed priorities;
- sharing information and enable knowledge transfer to a wide range of stakeholders across the EU.

The European Commission does not own or manage European Technology Platforms, which are independent organisations.

As of October 2013, 10 ETPs have been recognized by the Commission in the ICT sector:

- ARTEMIS: Embedded Systems.
- EUROP: Robotics.
- EPT4HPC: High Performance Computing.
- ENIAC: Nanoelectronics.
- EPoSS: Smart Systems Integration.
- ISI: Satellite.
- Net!works: Networks Infrastructure.
- Photonics21: Optical.
- NESSI: Software & Services.
- NEM: Networked media.

Recently, ARTEMIS and ENIAC merged to form the new Electronic Components and Systems for European Leadership (ECSEL) Joint Technology Initiative (JTI). The new ECSEL JTI is expected to start in early 2014 and to be fully operational up to 2020 followed by a running

down phase to 2024. It will bring together large companies, world-class European research and technology organizations linked with higher education research labs and SMEs providing technology and services.

Two of the above ETPs (e.g. NESSI and NEM) are more relevant to the field of Content Technologies and Information Management and their research priorities are presented in the following paragraphs.

2.1 NESSI research priorities

NESSI is the European Technology Platform dedicated to Software and Services. Its name stands for the Networked European Software and Services Initiative. NESSI provides a platform to allow industry, research centres and academia to discuss, elaborate and influence technological advancements, competitiveness and sustainability in the field of software and services research and innovation.

NESSI was established in 2005 but since then every dimension of the research and innovation landscape has changed often in a dramatic way. Information and Communication Technology (ICT) has progressed with accelerating pace and a clear convergence of technologies (telecoms and infrastructure, software and services, information and content). New paradigms have emerged, such as Cloud or Mobile Computing, and via in-memory computing the processing of large amounts of data is now possible in real-time, making data the currency of the new Internet. These changes influence how industry is innovating, how business is conducted and how research institutions are aligning the research and innovation needs of industry and society.

NESSI is a major player in this domain and drives these developments. It does this through a community of partners and members engaged in software, software-based services and data technologies that will enable citizens, the public sector and industry to thrive. As an ETP, its goal is as an industry-led stakeholder forum charged with defining research priorities in a specific technological area for the benefit of Europe.

NESSI's first objective is to engage with European ICT Industry and to promote the need for dramatic changes due to new ICT eco-systems and innovations which are a pre-requisite for Europe to stay competitive globally. Innovation will take place in infrastructure, software, platforms, products, services, and information. Individual technologies will advance in areas such as servicification of products, platforms interoperability, real-time data analytics, Software-as-a-Service (SaaS) and virtualisation and these will all be supported by advanced software engineering.

NESSI's mission is to open windows of opportunity in Europe for new services and applications which have business and societal value. NESSI's impact on Research and Innovation (R&I) strategy is based on a strong track record of significant contribution by all its stakeholders including strategic research agendas, white papers, position papers, and through R&I in many ground breaking projects.

NESSI thus provides value and benefits to its stakeholders and to the wider community through its contribution to research and innovation policy, to ICT work programs, and by furnishing the community with relevant information, providing networking forums to meet and partner, and providing an alignment of industry and academic research.

In April 2013, NESSI published the **NESSI Strategic Research and Innovation Agenda**, in which NESSI presents recommendations as key for achieving the ambitious goals set out in Horizon 2020. Recommendations are given with respect to research and innovation priorities for future activities launched in the context of Horizon 2020.

The content of this Agenda is the result of wide discussions within NESSI. It aggregates the input provided by NESSI Members through an online consultation, by the members of the NESSI Steering Committee and the recommendations of the former NESSI Strategic Research Agenda (2011).

As described in the above Agenda, NESSI has identified that Software and Services expertise is comprised mainly in three activity lines:

- **Next generation computing: Advanced computing systems and technologies;**
- **Future Internet: Infrastructures, technologies and services;**
- **Content technologies and information management: ICT for digital content and creativity.**

The Agenda provides recommendations referring to these three activity lines. The recommendations are structured around the seven following focus areas for each of which a set of research and innovation priorities is suggested:

1. **Quality in cloud-based heterogeneous service scenarios**
2. **Services benefiting from Programmable Networks**
3. **Service usage in a fast changing business world**
4. **Service and Software Engineering**
5. **New ways to increase software performance and energy-efficiency**
6. **Integration of Big Data Analytics into Business processes**
7. **Trust and security for global digital infrastructures and services**

The first four areas are addressing the activity line Future Internet, the fifth one fits to the Next Generation Computing activity line and the sixth one is mainly related to the activity line about Content and Information management. Finally, the last area, trust and security, spans across all these topics.

2.2 NEM research priorities

The **Networked and Electronic Media (NEM) Initiative** aims at building sustainable European leadership in content production and networking technologies. Its objective is to promote an innovative European approach to the convergence of media and telecommunications towards a Future Media Internet that will enhance the lives of European citizens through a richer media experience.

The NEM constituency includes all major European organisations working in the networked and electronic media area, including content providers, broadcasters, network equipment manufacturers, network operators and service providers, academia, standardisation bodies and government institutions. Those actors share a common Vision and have been producing a Strategic Research Agenda (SRA) as well as position papers, in order to accelerate the innovative development of the new sector in a harmonised and fruitful way and to place European industry at the forefront of the information era.

In September 2011, the NEM Position Paper on Future Research Directions was updated and complemented with detailed recommendations for future ICT research topics in Horizon 2020. The selection of topics is derived from a survey performed among all NEM members. The topics for which the NEM Community sees a specifically high importance in Horizon 2020 are:

Media-related applications and business models

- Social Networking and Media Sharing
- User Satisfaction and Quality of Experience

Content Creation

- New Forms of Content
- Representation of Content
- Tools for content creation and manipulation

Networking and delivery infrastructure

- Intelligent Delivery

Content search and media presentation

- User-system interaction
- Authentic, true-to-original media reproduction including Virtual Reality

Technology drivers and enabling technologies

- Data security and personal privacy
- Identity management and AAA (authentication, authorisation and accounting)
- Personalisation/profiling: Smart user profiles across all services & devices
- Power management technologies – energy saving in/by ICT
- Machine-Machine Communication.

An exhaustive list of all relevant NEM research areas for Horizon 2020 is given in Annex A.

3. ICT research priorities in EECA countries

The following EECA ICT priorities have been identified by PICTURE project (deliverable D2.1a: «Updated report about the EECA ICT priorities»). The report was based on the findings of the EECA cluster project[1], on review of new national ICT policy documents (up to January 2013) and on interviews/ contacts with national ICT policy stakeholders.

Russian Federation

Identified Priority topics:

- **Topic 1: Advanced Software Engineering.** Rational for selection: Russia has profound background in both applied software development and systems development. Latest initiatives of the Russian Government on Software Engineering, including creation of the National Software Platform, manifest the intention to replace imported software in state governance and enterprises with open-source alternatives. Selection of open-source products opens the way to unique mutually beneficial cooperation between EU and Russia. Open-source software does not have borders, it easily allows for collaborative development and reuse in various scenarios. Establishment of the National Software Platform provides an opportunity to set up cooperation at the level of big industrial/research consortia that ETP actually are. Such cooperation might result in further clarification of Strategic Agendas and Implementation Plans.
- **Topic 2: Embedded Systems Robotics / Intelligent Systems.** Rational for selection: Embedded systems are widely used to control complex systems. Russian research bodies and private companies are active at development of new hardware and software embedded systems; focus is on the real-time control systems and extreme conditions of operations. EU-RF R&D collaboration in the field of embedded electronics components will contribute to increasing the share of the ES value in the final product especially in sectors such as Industrial, Telecommunications, Consumer Electronics, Smart Homes and Health/Medical Equipment. This domain is supported by the National Platform on Mechatronics, Embedded Control Systems, RFID and Robotics.
- **Topic 3: GRID and Cloud computing / High-performance computing.** Rational for selection: Russia has developed an outstanding expertise in key fundamental research domains such as micro/nanoelectronic, aerospace and other scientific domains making strong use of mathematical background. All of these require intensive modeling and computations. High Performance Computing (HPC), including Grid computing, cloud computing, supercomputers, is the major research tool in physics, chemistry, biology and other sciences. HPC is one of the driving forces of the modern technology; it is used in automobile, aerospace, microelectronics and other industries. Russia has a critical mass of competences in HPC systems design and implementation and its applications to various needs of natural sciences and national industries.
- **Topic 4: Network of the Future.** Rational for selection: The vastness of the territory of Russia gives a unique opportunity for large scale networking infrastructures, providing access to new and next generation services for more than 10% of the Earth's land. It calls for new communication media, new security challenges and trust infrastructures. There are some valid reasons to raise the importance of EU-RU joint projects in this field. Firstly this area has a great potential related to growing

[1] EECA cluster project was the joint effort of 3 complementary FP7-ICT support actions (ISTOK-SOYUZ, SCUBE-ICT and EXTEND) that were running from January 2009 until June 2011 with the common mandate of strengthening the cooperation between EU and EECA countries in the field of Information and Communication Technologies (ICT). One of the cluster's achievements was the identification of ICT R&D priorities for cooperation between the EU and the EECA countries.

interoperability between infrastructures. Secondly, EU scientists attesting very strong theoretical background need to reinforce the "proof of the concept" level and validation of research results. Russian IT researchers possess very strong software engineering skills, which has a great impact on rapidly proving the conceptions in applied research areas. Finally, the joint next generation IT projects can incite a huge interest of business investors requiring for quite obvious demonstrations of success and for rapidity of technology commercialization. This ICT domain correlates with the National Software Platform.

- **Topic 5: Nanoelectronics.** Rational for selection: Nanotechnologies are included into the list of the critical technologies of the Russian Federation. State Corporation "RosNano" was established to fund fundamental and applied research in this area. Several leading research centers including Kurchatov Institute were oriented towards research in nanotechnologies. It is reasonable to launch collaborative action relevant to the entire topic of nanoelectronics. Russia has critical scientific mass and advanced technological competences in the entire nanoelectronics area. These domains are supported by the National Platform "Innovative Laser, Optical and Optoelectronical Technologies – Photonics" and RUSNANO State Corporation.
- **Topic 6: Digital Libraries.** Rational for selection: The research EU-RF project will boost the development of new digital library centers (academic library, law library, medical library, etc.). R&D joint projects will contribute to achieving excellence for digitization and preservation processes. They will integrate knowledge access for technology-based and traditional companies increasing their competitiveness. A particular challenge that joint EU-RU projects should address is the need to develop stronger and more varied forms of privacy protection. A new integration initiative "Scientific Heritage of Russia" was launched in 2010 that embraces libraries of the Russian Academy of Sciences, universities and research centers and sets and ambitious goal of providing united access to the whole body of scientific texts in the Russian language.
- **Topic 7: ICT for Health.** Rational for selection: Health research is positioned as one of the three strategic areas for cooperation with the European Union. The health market in Russia offers important potential and is set to grow quickly. The Russian market for medical technology is worth 2 billion $ a year and is growing by about 15% per annum. European IT providers can strengthen their presence in Russia's healthcare market. In 2011 the government approved creation of "Medicine of the Future" Technology platform as well as two RTPs on biology and related sciences. Rapid advance in the area of ICT for Health is expected, thanks to new level of cooperation and integration in Russia that RTPs should provide.
- **Topic 8: Security Trustworthy ICT.** Rational for selection: Security is a specific topic in Russian ICT since its primary customers are law enforcement and defense agencies. As a result it is notably closed for cooperation. Still in 2011 the initiative of the National Software Platform proclaimed security as one of the key objectives of the platform, with stress on open-source and redistributable hardware and software systems. This gives a perspective of opening R&D in security for international cooperation. This ICT domain is covered by National Software Platform.

Eastern Partnership (EaP) countries

Identified Priority topics:

- **Topic 1: GRID and Cloud Computing.** Rational for selection: EaP countries are actively developing their own Grid infrastructures, and close collaboration and interaction with the European Grid Infrastructure is foreseen. It is reasonable therefore to envisage developing interoperable solutions and standards as well as pilot actions for cooperation around the topic of advanced programming techniques for supercomputing. Some countries are members of EGI, most EaP countries are connected to the Pan-European GÉANT network and are willing to develop further this cooperation with EU.

- **Topic 2: ICT for e-learning and digital information services.** Rational for selection: Universities, research institutes, libraries and cultural centres could be involved in activities on information digitizing as well as new technologies for digital information access development. The development of such sub-priorities as digital libraries, e-services for access to cultural heritage and technology enhanced learning, such as E-learning resources are amongst the most important priorities.

- **Topic 3**: **Nanoelectronics, Microelectronics**. Rational for selection: the EaP countries possess a high level expertise in this topic and a critical mass of high-level researchers. Common scientific programmes are being implemented within the EECA countries cooperation activities, and some shared infrastructure has been developed. The new generation of components and systems development is also of great importance nowadays.

- **Topic 4**: **Electronic governance (e-governance), including intelligent information management.** Rational for selection: EaP countries are planning to create new services for home and international citizens (as well as for business, simplifying regulatory procedures) with the help of new ICT solutions. The joint development of agreed solutions is an important task.

- **Topic 5: ICT for Health.** Rational for selection: this topic is one of the most significant societal challenges in EaP countries, as well as in the EU. It is important to develop interoperable solutions and standards within this field as well as to foster technical solutions implementation in EaP countries that would be in line with the best European practices.

Central Asia (CA) countries

Identified Priority topics:

- **Topic 1: Advanced Networking.** Rational for selection: Communication infrastructure and services are developing very rapidly in Central Asia countries. The development of cooperation with EU countries will result in a decrease in the technology gap with the CA countries and an increasing level of their own R&D activities. It is reasonable to envisage the Grid and Cloud computing as pilot actions for the training of local researchers & engineers, with the aim to develop shared regulations and use of interoperable standards in EU and CA countries.

- **Topic 2: ICT for e-governance, e-learning and digital information services.** Rational for selection: Providing citizens and industries with an access to information via new technologies is recognised as a key tool of democratic development in CA countries. As for now, an active integration of new digital services is taking place. The development of such sub-priorities as corporate systems and networks supporting digital libraries, e-services for access to cultural heritage and scientific and educational knowledge are among the most important. These services can be developed for cultural heritage preservation, digital libraries and education projects. Many R&D organizations of CA countries area are already adapting current technologies and have started developing their own applications.

- **Topic 3: ICT for Health, including telemedicine and interoperability of patient summary between EU and CA countries**. Rational for selection: This topic is one of the most significant societal challenges in CA countries, as well as in the EU. It is important to develop interoperable solutions and standards within this theme as well as to foster technical solutions implementation in CA countries that would be in line with the best European practices.

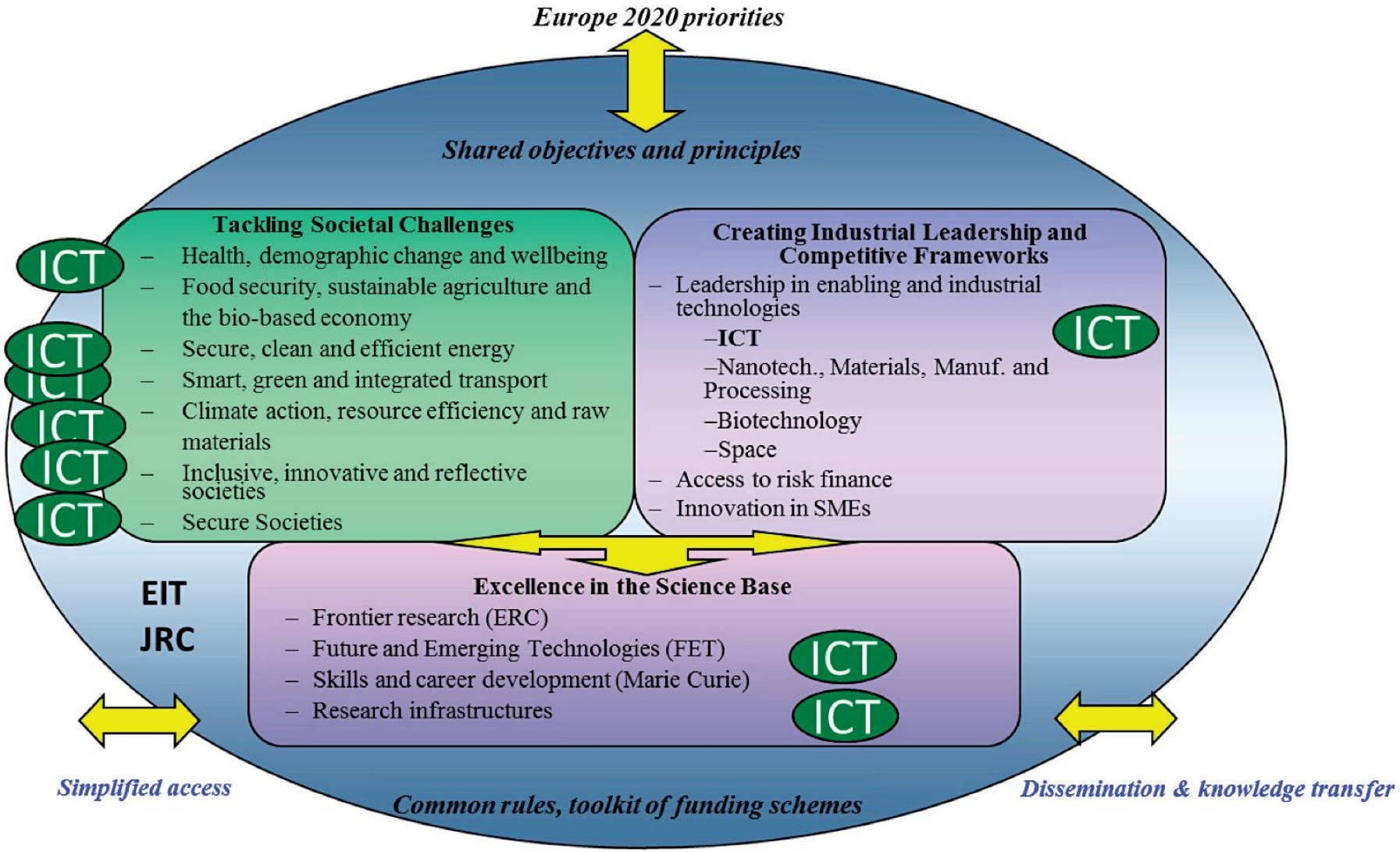
- **Topic 4: Process automation in resources management trials,** (***note****: this is not considered a "priority R&D topic" in Central Asia for the moment, but this is the topic that corresponds to the local needs/demand; the relevant technologies are currently acquired abroad)*. Rational for selection: CA countries concentrate on the engineering of new infrastructures and development of locally tailored applications. As such they are eager to incorporate new R&D advances in their deployments and as such offer testbeds and trial environments, especially in the fields of resource management (energy, water).

4. Horizon 2020

Horizon 2020 is the financial instrument implementing the Innovation Union, a Europe 2020 flagship initiative aimed at securing Europe's global competitiveness. Running from 2014 to 2020, the EU's new programme for research and innovation is part of the drive to create new growth and jobs in Europe. Horizon 2020 will focus resources on the following key priorities (ICT-related topics are written with bold characters):

1. Excellent Science:
    - Frontier Research (ERC);
    - **Future and Emerging Technologies (FET);**
    - Skills and career development (Marie Curie);
    - **Research infrastructures.**
2. Industrial Leadership:
    - Leadership in enabling and industrial technologies:
        - **ICT:**
            - ✓ **A new generation of components and systems:** Developing new generation of components and systems including *s*mart embedded components and systems, micro-nano-bio systems, organic electronics and complex systems engineering;
            - ✓ **Advanced computing:** Advanced computing systems and technologies;
            - ✓ **Future Internet:** Network infrastructures, technologies and services for the future Internet;
            - ✓ **Content technologies and information management:** including ICT for digital content and creativity**;**
            - ✓ **Robotics:** Service robotics, cognitive systems, advanced interfaces and smart spaces;
            - ✓ **Micro- and nano-electronic technologies, Photonics;**
        - Advanced materials, advanced manufacturing and processing;
        - Biotechnology;
        - Space;
    - Access to risk finance;
    - Innovation in SMEs.
3. Societal Challenges:
    - **Health, demographic change and wellbeing** (e-health, self management of health, improved diagnostics, improved surveillance, health data collection, active ageing, assisted living);
    - Food security, sustainable agriculture, marine and maritime research and bio-economy;
    - **Secure, clean and efficient energy** (smart cities, Energy efficient buildings, smart electricity grids, smart metering);
    - **Smart, green and integrated transport** (smart transport equipment, infrastructures and services, innovative transport management systems, safety aspects)**;**
    - **Climate action, environment, resource efficiency and raw materials** (ICT for increased resource efficiency; earth observation and monitoring);
    - **Innovative, inclusive, and reflective societies** (digital inclusion; digital skills; social innovation platforms; e-government services; e-learning; e-culture);
    - **Secure societies** (cyber security; ensuring privacy and protection of human rights on-line).

The structure and the objectives of Horizon 2020 are better illustrated in the next figure.



Horizon 2020 – Objectives and Structure

5. Common research priorities

In the following paragraphs we illustrate the identified common research priorities between the relevant ETPs (i.e. NEM and NESSI) and the EECA region following the objectives and structure of Horizon 2020. This mapping is based only in literature review (SRAs, relevant PICTURE project deliverables, etc.) and is must be finalized, fine-tuned and expanded after a consultation procedure with all the relevant stakeholders.

5.1 Mapping H2020, selected ETPs and EECA region (Industrial Leadership)

#	TOPICS	NEM	NESSI	RUSSIA	EaP	CA
1.	A new generation of components and systems: engineering of advanced and smart embedded components and systems			Embedded Control Systems, RFID and Robotics.	Components, Systems, Engineering	
2.	Next generation computing, Advanced computing systems and technologies	Media Cloud, Cloud proxy	New ways to increase software performance and energy-efficiency	GRID and Cloud Computing, High-performance computing.	Grid and Cloud Computing	Cloud Computing, Super Computing
3.	Future Internet, network infrastructures, technologies and services	Networking and delivery infrastructure Media related applications and business models Machine-machine Communication Personalisation / profiling: Smart user profiles across all services & devices	Quality in cloud-based heterogeneous service scenarios Services benefiting from Programmable Networks Service usage in a fast changing business world Service and Software Engineering	National Software Platform.	Internet of Services, Future Internet	Internet of services
4.	Content technologies and information management, ICT for digital content and creativity	Content creation Content search and media presentation	Integration of Big Data Analytics into Business processes	Digital Libraries	Intelligent information management, Digital Libraries	Digital services, Digital Libraries and Digital Preservation

#	TOPICS	NEM	NESSI	RUSSIA	EaP	CA
5.	Advanced interfaces and robots, robotics and smart spaces	Advanced interfaces		Embedded Control Systems, RFID and Robotics.	Robotics	
6.	Micro- nano-electronics and photonics			National Platform "Innovative Laser, Optical and Optoelectronical Technologies – Photonics"	Nanoelectronics Technology and Microelectronics Components, Photonics	

Core		**Large interest**		**Minor interest**	

5.2 Mapping H2020, selected ETPs and EECA region (Societal Challenges)

#	TOPICS	NEM	NESSI	RUSSIA	EaP	CA
1.	Health, demographic change & wellbeing; e-health, self management of health, improved diagnostics, improved surveillance, health data collection, active ageing, assisted living	Ageing societies, Public health, Pandemics		ICT for Health	ICT for Health	ICT for Health
2.	Secure, clean and efficient energy; Smart cities; Energy efficient buildings; smart electricity grids; smart metering				ICT systems for Energy Efficiency	ICT systems for Energy Efficiency
3.	Smart, green and integrated transport; Smart transport equipment, infrastructures and services; innovative transport management systems; safety aspects	NEM Position paper on Intelligent Transport Systems (October 2010)				
4.	Climate action, environment, resource efficiency and raw materials; ICT for increased resource efficiency; earth observation and monitoring	Global warming				
5.	Inclusive, innovative and secure societies; Digital inclusion; social innovation platforms; e-government services; e-skills and e-learning; e-culture; cyber security; ensuring privacy and protection of human rights on-line	Data security and personal privacy Identity management and AAA (authentication, authorisation and accounting)	Trust and security for global digital infrastructures and services	Security, Trustworthy IT	Electronic governance, Technology-Enhanced Learning	ICT for e-governance, e-learning

Core		Large interest		Minor interest	

6. Conclusions from the Workshop on Content Technologies and Information Management

PICTURE's Content Technologies and Information Management Workshop took place on the 24th of May, 2013 at National Technical University of Ukraine. The Workshop was attended by 49 ICT stakeholders that can be classified in the following categories:

- representatives from European Technology Platforms (NESSI and NEM);
- high level ICT stakeholders from the EECA region;
- members of PICTURE Working Group 3 on "Content Technologies and Information Management";
- PICTURE consortium members.

The agenda included:

- Presentations of the represented ETPs (NESSI and NEM) with focus on their research priorities under Horizon 2020.
- Presentations of the R&D ICT potential of each represented EECA country.
- Presentation of the previous version of the present document (a map that connects ETPs research priorities with those of the EECA region in light of HORIZON's 2020 societal challenges).
- Open discussion session to validate common research priorities and to identify potential joint activities for future cooperation between the represented ETPs and the EECA region.

The main conclusion that came out of the Workshop was that there are significant opportunities for cooperation between the European Technology Platforms (namely NESSI and NEM) and similar structures and interested stakeholders from the EECA countries in the field of "Content Technologies and Information Management". As first steps for future collaboration the following were proposed:

- Interested EECA organizations can easily become members of NESSI and NEM through their web sites, without any membership fee. The benefits of the membership are threefold:
    - a member of the platform receives promptly all the information about research agendas, activities and events;
    - a member has the opportunity to communicate with other members, to find new ideas and partners and to present his project ideas to potentially interested stakeholders both through face to face meetings during events and through position papers;
    - a member has the opportunity to become involved in the shaping of ETP's research strategy through the process of strategic agenda formulation.

Important note: Some participants from the EECA countries have already become members of the represented ETPs.

- Interested EECA organizations can participate in ETPs events to propose their projects ideas. It's better for the EECA organizations and stakeholders to prepare and submit papers in such events in order to be more active.

A special session for the EECA region and its ICT potential and priorities could be arranged in a future event organized by the represented ETPs after consultation with the relevant Steering Committee.

Local PICTURE partners should provide information about ETPs to interested ICT stakeholders in their respective countries. This information will concern the structure, main activities, R&D&I priorities of the ETPs and funding programmes, projects etc.

The common research priorities between ETPs and the EECA region that were identified by PICTURE project prior to the Workshop are too generic and they should become more specific in order to provide a framework for future cooperation. In this effort the analysis of the Work Programmes of the 1st period of HORIZON 2020 should be taken into account.

Cooperation between the two ETPs and the EECA region should be build around common societal challenges (e.g. digital divide, e-health, e-governance) and specific problems / topics (e.g. electronic voting for Moldova). A clear identification of the common topics and the relevant technologies will aid in the development of successful joint proposals for HORIZON 2020.

It will be helpful to study how others regions (e.g. Mexico, India, Jordan) are already cooperating with the ETPs. NEM platform has already developed an agenda for international cooperation (Global NEM) that is updated regularly. Members of WG3 on "Content Technologies and Information Management" should be involved in the next update of the above agenda.

7. Common research priorities in EU (H2020 2014-2015 Workprogramme) and EECA

According to the outcomes of the Workshop on Content Technologies and Information Management, the collaboration between the selected ETPs and the EECA region can be built around research projects and initiatives funded by the European Union under HORIZON 2020.

In work programme 2014-15, ICT-related topics are covered as follows:

- Advanced research to uncover radically new technological possibilities and ICT contributions to research and innovation are addressed in the 'Excellent science' part of the work programme, respectively under 'Future and Emerging Technologies' and 'European research infrastructures' ('eInfrastructures');
- Research and innovation activities on generic technologies either driven by industrial roadmaps or through a bottom up approach are addressed in the 'Leadership in enabling and industrial technologies' (LEIT) part of the work programme, under 'Information and communication technologies';
- Multi-disciplinary application-driven research and innovation leveraging ICT to tackle societal challenges are addressed in the different 'Societal challenges'.

In the following sub-sections, the PICTURE partners analysed the Work Programmes of the HORIZON 2020 for the period 2014-2015, with a view to highlight the most relevant to the Content Technologies and Information Management domain, which are outlined below.

7.1 LEIT – Information and Communication Technologies

This part covers the following ICT technological areas:

1. A new generation of components and system,
2. Advanced Computing,
3. Future Internet,
4. Content technologies and information management,
5. Robotics,
6. Micro- and nano-electronic technologies, Photonics.

The work programme also includes cross-cutting, horizontal and international activities. Furthermore ICT topics are covered in the call for the factories of the future, which spans both the "ICT" and the "Nanotechnologies, Advanced Materials, Biotechnology and Advanced Manufacturing and Processing".

In LEIT, topics related to Content Technologies and Information Management take centre stage in the following areas:

Area: Advanced Computing

With the wider diffusion of embedded ICT and cyber-physical systems and the advent of the Internet of things, customised heterogeneous low-power computing systems delivering high performance functionality under real-time constraints will drive a large part of computing development in the next decade.

Combined with the need for more energy efficient cloud computing systems and data centres, the same key low-power technologies will underpin progress across the whole computing spectrum. The strategic focus is to reinforce and expand Europe's industrial and technology strengths in low-power ICT. Different market segments should be addressed through an integrated cross-layer (hardware, system, programming, algorithms) and cross application/ cross-market approach.

One topic is identified under this area:

- ICT 4 – 2015: "Customised and low power computing"

Area: Future Internet

Over the last 30 years, the Internet has become a major infrastructure for growth, job creation, and social progress. Internet must continue to foster and support development and to accommodate all the diverse usages for which it was not initially foreseen. The aim is therefore to address the most critical technical and use aspects for the Internet to be apt to support the huge future expectations of society at large.

The Future Internet topics will therefore i) address the limitations of an Internet not designed to support the very large set of requirements imposed by an ever more diversified usage; ii) support the advent of more efficient computational and data management models responding to the challenges posed by increased device / object connectivity and data-intensive applications; iii) leverage the Internet to foster innovative usages of social and economic value also benefiting from the geospatial capabilities of the Future Internet. The area strategy is based on a complementary set of technology push – usage pull actions.

From our perspective, the most relevant topics under this area are the following:

- ICT 5 – 2014: Smart Networks and novel Internet Architectures
- ICT 6 – 2014: Smart optical and wireless network technologies
- ICT 7 – 2014: Advanced Cloud Infrastructures and Services
- ICT 8 – 2015: Boosting public sector productivity and innovation through cloud computing services
- ICT 9 – 2014: Tools and Methods for Software Development
- ICT 10 – 2015: Collective Awareness Platforms for Sustainability and Social Innovation
- ICT 13 – 2014: Web Entrepreneurship.

Area: Content technologies and information management

The cultural and creative sectors account for 3.3% of GDP and employ 6.7 million people (3% of total employment) in the EU. Moreover, worldwide Big Data technology and services are expected to grow from EUR 2.4 billion in 2010 to EUR 12.7 billion in 2015. The challenge is to strengthen Europe's position as provider of innovative multilingual products and services based on digital content and data, addressing well identified industry and consumer market needs. Research and Innovation activities in this challenge will provide professionals and citizens with new tools to model, analyse, and visualise vast amounts of data from which to extract more value, to make an intelligent use of data coming from different sources and to create, access, exploit, and re-use all forms of digital content in any language and with any device.

The following topics were identified under this area:

- ICT 15 – 2014: Big data and Open Data Innovation and take-up
- ICT 16 – 2015: Big data – research
- ICT 17 – 2014: Cracking the language barrier
- ICT 19 – 2015: Technologies for creative industries, social media and convergence
- ICT 20 – 2015: Technologies for better human learning and teaching

Area: ICT Cross-Cutting Activities

In this area the most relevant topics are the following:

- ICT 30 – 2015: Internet of Things and Platforms for Connected Smart Objects
- ICT 31 – 2014: Human-centric Digital Age
- ICT 32 – 2014: Cybersecurity, Trustworthy ICT

7.2 SC1, Health, demographic change and wellbeing

ICT, which does have a prominent role in this societal challenge, is addressed in dedicated topics in the two calls in the challenge "Personalising health and care" (PHC) and the call on co-ordination activities (HCO). Following is a list of selected topics that are relevant to the Content Technologies and Information Management domain.

Area: Advancing active and healthy ageing

- PHC 20 – 2014: Advancing active and healthy ageing with ICT: ICT solutions for independent living with cognitive impairment. The challenge is to deploy innovative and user led ICT pilot projects in support of independent living with cognitive impairments and translate promising results into scalable practice across Europe.
- PHC 21 – 2015: Advancing active and healthy ageing with ICT: Early risk detection and intervention. ICT based solutions are sought which support active and healthy ageing by enabling early detection and minimisation of risks associated with ageing, including (but not limited to) cognitive impairment, frailty, depression and falls.

Area: Integrated, sustainable, citizen-centred care

- PHC 25 – 2015: Advanced ICT systems and services for Integrated Care. The objective is to go beyond the current state of art in tele-health and tele-care systems by developing new approaches for integrated care supported by ICT systems and services.
- PHC 27 – 2015: Self-management of health and disease and patient empowerment supported by ICT. This topic requires research into socio-economic and environmental factors and cultural values, behavioural and social models, attitudes and aspirations in relation to personalised health technologies, mobile and/or portable and other new tools, co-operative ICTs, new diagnostics, sensors and devices (including software) for monitoring and personalised services and interventions which promote a healthy lifestyle, wellbeing, mental health, prevention and self care, improved citizen/healthcare professional interaction and personalised programmes for disease management.
- PHC 28 – 2015: Self-management of health and disease and decision support systems based on predictive computer modelling used by the patient him or herself. Projects will focus on predictive systems based on computer modelling and will develop decision support systems (DSS) that will be used by the individual. The DSS shall include the collection of various data (patient, clinical, biological, therapeutic, behavioural, environmental or occupational exposure, physical training and performance, lifestyle and diet, environmental data, social data etc.).
- PHC 30 – 2015: eHealth Sectoral Inducement Prize. This prize will reward the development of an interactive health and wellbeing app.

Area: Improving health information, data exploitation and providing an evidence base for health policies and regulation

- PHC 31 – 2015: Digital representation of health data to improve disease diagnosis and treatment
- PHC 35 – 2014: eHealth interoperability

7.3 SC3 - Secure, clean and efficient energy

The Energy Challenge includes three calls: "Energy Efficiency", "Competitive Low-Carbon Energy" and "Smart Cities and Communities". Following is a list of selected objectives for the years 2014/2015 that are relevant to the Content Technologies and Information Management domain.

CALL: Energy Efficiency

- EE 11 - New ICT-based solutions for energy efficiency. The focus will be on the creation of innovative IT ecosystems that would develop services and applications making use of information generated by energy consumers (e.g. through social networks) or captured from sensors (e.g. smart meters, smart plugs). These applications range from Apps for smart phones and tablets to serious games to stimulate consumers' participation in the market.

CALL: Competitive Low-Carbon Energy

- LCE 7 – 2015: Distribution grid and retail market. One of the objectives of this topic is to prepare the development of the next generation ICT infrastructure for smart metering and smart grids

CALL: Smart Cities and Communities

- SCC 1 – 2014/2015: Smart Cities and Communities solutions integrating energy, transport, ICT sectors through lighthouse (large scale demonstration - first of the kind) projects, which represents by far the main part of this call. The objective of the topic is to identify, develop and deploy replicable, balanced and integrated solutions in the energy, transport, and ICT actions through partnerships between municipalities and industries.

7.4 SC4 - Smart, green and integrated transport

The "Smart, green and integrated transport" Challenge includes three calls: "Mobility for Growth", "Green Vehicles" and "Small Business and Fast Track Innovation for Transport". From the above three calls only the first one seems to have topics that are relevant to the Content Technologies and Information Management domain.

CALL: Mobility for growth

ROAD transport, with two topics:

- MG.3.5-2014. Cooperative ITS for safe, congestion-free and sustainable mobility
- MG.3.6-2015. Safe and connected automation in road transport

URBAN MOBILITY:

- MG.5.3-2014. Tackling urban road congestion

LOGISTICS:

- MG.6.3-2015. Common communication and navigation platforms for pan- European logistics applications

INTELLIGENT TRANSPORT SYSTEMS:

- MG.7.1-2015. Connectivity and information sharing for intelligent mobility
- MG.7.2-2014. Towards seamless mobility addressing fragmentation in ITS deployment in Europe

7.5 SC5 - Climate action, environment, resource efficiency and raw materials

The "Climate action, environment, resource efficiency and raw materials" Challenge includes three calls: "Waste: A Resource to Recycle, Reuse and Recover Raw Materials", "Water Innovation: Boosting its value for Europe" and "Growing a Low Carbon, Resource Efficient Economy with a Sustainable Supply of Raw Materials". Following is a list of selected objectives for the years 2014/2015 that are relevant to the Content Technologies and Information Management domain.

Call - Waste: A Resource to Recycle, Reuse and Recover Raw Materials

- WASTE-1-2014: Moving towards a circular economy through industrial symbiosis
- WASTE-2-2014: A systems approach for the reduction, recycling and reuse of food waste
- WASTE-3-2014: Recycling of raw materials from products and buildings
- WASTE-4-2014/2015: Towards near-zero waste at European and global level

Call – Water Innovation: Boosting its value for Europe

- WATER-1-2014/2015: Bridging the gap: from innovative water solutions to market replication

7.6 SC6 – Europe in a changing world – Innovative, inclusive, and reflective societies

Following is a list of selected objectives from the "Inclusive, innovative and reflective societies" Challenge that are relevant to the Content Technologies and Information Management domain.

Call: Reflective Societies: Cultural Heritage and European Identities

- REFLECTIVE 6 – 2015: Innovation ecosystems of digital cultural assets
- REFLECTIVE 7 – 2014: Advanced 3D modelling for accessing and understanding European cultural assets

Call: New Forms of Innovation

- INSO 1 - 2015: Innovation in the public sector by using emerging ICT technologies
- INSO 2 – 2014, 2015: ICT-enabled open government
- INSO 8 - 2014: Platform for ICT for Learning and Inclusion
- INSO 9 – 2014: Innovative mobile e-government applications by SMEs

7.7 SC7 - Secure societies – Protecting freedom and security of Europe and its citizens

Following is a list of selected objectives from the "Secure societies" Challenge that are relevant to the Content Technologies and Information Management domain

Call – Digital Security: Cybersecurity, Privacy and Trust

- DS 1 – 2014: Privacy
- DS 2 – 2014: Access Control
- DS 3 - 2014: The role of ICT in Critical Infrastructure Protection
- DS 4 -2015: Secure Information Sharing
- DS 5 – 2015: Trust eServices
- DS 6 – 2015: Risk management and assurance models

8. Conclusions

The main conclusion that came out of the above analysis is that there are significant opportunities for cooperation between the European Technology Platforms (namely NESSI and NEM) and similar structures and interested stakeholders from the EECA countries in the field of "Content Technologies and Information Management. The cooperation between the two ETPs and the EECA region should be build around common societal challenges (e.g. digital divide, e-health, e-governance) and specific problems / topics.

The two regions share several common priorities that can become the basis for collaborative research projects and initiatives funded by the European Union under HORIZON 2020. New relevant EU projects (such as EECA-2-HORIZON) can aid in the development of successful joint proposals for HORIZON 2020 by clarifying in detail and updating the common topics and the relevant technologies of mutual interest.

9. Annex: Result of the NEM Survey on most important Research Topics

NEM research topics relevant for HORIZON 2020 ICT Research

1 Media-related applications and business models

1.1 Value web

Web as public service platform

Virtual meetings

* **1.2 Social networking and media sharing**

* Social community control and reputation

* Creative communities (including distributed content production)

* **1.3 User satisfaction and quality of experience**

* Smart User profiles across all services & devices

2 Content creation

* **2.1 New forms of content**

* Smart content

* Capturing of true 3D, holographic and augmented reality A/V environments

* **2.2 Representation of content**

Modelling formats

Scene-based content description

* Automatic rich metadata extraction

* **2.3 Tools for content creation and manipulation**

* Content capture (Including 3D content)

* Metadata driven content databases

Standardised production middleware

Content manipulation

Content adaptation

Content scalability on the move

Content management systems (including for distributed production)

2.4 Overcoming human language barriers

3 Networking and delivery infrastructure

* **3.1 Intelligent delivery**

Context/content aware networks

Internet governance technique

Intelligent traffic management (including temporary usage of "white spaces")

Smart access nodes

3.2 Quality of service

Intelligent P2P services

3.3 Network architecture

4 Content search and media presentation

4.1 Automated semantic annotation

* **4.2** Authentic, true-to-original media reproduction including Virtual Reality

* True-3D/holographic reproduction of A/V content

Seamless mix of real and virtual content

* **4.3 User-system interaction**

* Interaction and interfaces for 3D content

Adaptive human-machine interfaces

Natural language processing (speech control of devices)

4.4 Effective recommendation systems

4.5 Smart advertising embedded in content

4.6 User number measurement and user behaviour logging

Real time and total audience measurement

Audience research whilst respecting the right on private data

4.7 Cognitive content search tools

Intelligent search adapted to human ways of thinking

Intelligent aggregation of search results (e.g. ontology- based)

5 Technology drivers and enabling technologies

* **5.1 Data security and personal privacy**

5.2 Rights management

5.3 Federated virtual devices

5.4 Open federated services and platforms

5.5 Contextual awareness

5.6 Location

* **5.7 Identity management and AAA**

5.8 Micro payment

5.9 Personalisation/profiling

* Smart user profiles across all services & devices

5.10 Charging and payment

Real time and total audience measurement

5.11 Middleware

5.12 Assisted Living

Bio-sensors and multimodal sensors

* **5.13 Power management technologies - energy saving**

Energy efficiency of networked electronic media

Influence of networked media R&D on energy efficiency of other sectors

Ubiquitous and seamless connection
Hybrid Distribution
Broadcast/Broadband

3.4 Home and extended home networks

3.5 Green network design

3.6 Support for Cloud services (incl. cloud gaming, archiving, computing, etc.)

New batteries/energy technology

5.14 Spectrum economy

* **5.15 Machine-Machine communication**

6 Overall

* Hide complexity – simple to use

* Free end-user from hard and software maintenance
Make user the master – not the device

*** * ***: Topics for which the NEM Community sees a specifically high importance in FP8 (HORIZON 2020). Results derived from the open survey performed in April/May 2011.