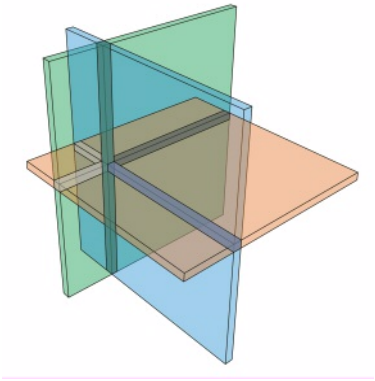
K-Space



Knowledge Space of Shared Technology and Integrative Research to Bridge the Semantic Gap

-Network of Excellence-

Date of preparation: **March, 2005**

List of Participants:

Participant no.	Participant Name	Short Name	Country
1	Queen Mary, University of London (Coordinator)	QMUL	UK
2	Koblenz University	KU	D
3	Joanneum Research Forschungsgesellschaft mbH	JRS	AT
4	Informatics and Telematics Institute	ITI	GR
5	Dublin City University	DCU	IR
6	Centrum voor Wiskunde en Informatica	CWI	NL
7	Groupe des Ecoles des Télécommunications	GET	F
8	Institut National de l'Audiovisuel	INA	F
9	Institut Eurécom	EURECOM	F
10	University of Glasgow	GU	UK
11	German Research Centre for Artificial Intelligence	DFKI	D
12	Technische Universität Berlin	TUB	D
13	Ecole Polytechnique Fédérale de Lausanne	EPFL	CH
14	University of Economics, Prague	UEP	CZ

Co-ordinator name: **Ebroul Izquierdo**
Co-ordinator organisation: **Queen Mary, University of London**
Co-ordinator email: **ebroul.izquierdo@elec.qmul.ac.uk**
Co-ordinator fax: **+44 20 7882 7997**

Strategic Objective 2.4.7, "Semantic-based Knowledge and Content Systems", FP6-2004-IST, 4th Call

K-Space Supporting Boards

Core members of the Industrial Advisory Board:

Participant no.	Participant Name	Short Name	Country
IAB1	Motorola Research, UK (Leader)	MRUK	UK
IAB2	Deutsche Welle	DW	D
IAB3	British Telecommunications PLC	BT	UK
IAB4	Telefonica I+D	TID	E

Core members of the Board of Scientific Advisors:

Participant no.	Participant Name	Short Name	Country
BSA1	Carnegie Mellon University Prof. Tsuhan Chen	CMU	USA
BSA2	University of California at Berkeley Prof. Marc Davis, SIMS Group	UCB	USA
BSA3	Imperial College London Dr. Stefan Rueger	ICL	UK
BSA4	Universitat degli Studi di Firenze Prof. Alberto Del Bimbo (to be confirmed)	UF	I

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Proposal Summary

Proposal full title: **Knowledge Space of Shared Technology and Integrative Research to Bridge the Semantic Gap**

Proposal acronym: **K-Space**

Strategic objective: **2.4.7 – Semantic-based Knowledge and Content Systems-**

Abstract: K-Space will create a sustainable network of world-leading research teams from academia and industry to conduct integrative research and dissemination activities in ***semantic inference for both automatic and semi-automatic annotation and retrieval of multimedia content***, aiming at closing the gap between the low-level content descriptions that can be computed automatically by a machine and the richness and subjectivity of semantics in high-level human interpretations of audiovisual media: ***The Semantic Gap***. Specifically, K-Space integrative research will focus on three key areas:

- Content-based multimedia analysis: Tools and methodologies for low and medium-level signal processing, natural language and speech processing, multimodal techniques, high dimensionality reduction, low-level feature fusion and data mining.
- Knowledge extraction: Bridging the semantic gap using both semantic and content based multimedia analysis. Building of a multimedia ontology infrastructure, knowledge acquisition from multimedia content, knowledge-assisted multimedia analysis and annotation, visual context and automatic detection of high level concepts.
- Semantic multimedia: adaptation of existing languages, representation of extracted semantic information, multimedia context and reasoning and their integration with Semantic Web technologies.

A main objective of the Network is to implement an open and expandable framework for collaborative research on knowledge acquisition based on a common distributed system made up of flexible, modular and interconnected technology: ***The Knowledge Space of Technology to Bridge the Semantic Gap,* "K-Space"**. K-Space will integrate complementary expertise, enable resource optimization and sharing, and foster innovative research in semantic inference for semi-automatic annotation and retrieval of multimedia content.

To ensure that the output of the targeted research becomes the primary feeding ground for industrial innovation, an ***Industrial Advisory Board*** with a core of four key industrial players has been set up and has been consulted from the very outset of proposal building. The Industrial Advisory Board will be expanded and become a key component of the network, if the project is funded. Its mission is to assist the network in defining research directions and to advise on potential exploitation of research results as they emerge, ensuring that the targeted research does not becomes unfocused and self-serving but leads to innovative products.

Specific dissemination objectives of K-Space include: (a) dissemination of the technical developments of the network across the broad research community, (b) delivering the means to bring the results beyond the research community in a way that appeals to the EU citizen (c) enabling the non specialist multimedia user to feedback into the K-Space technological framework and (d) influencing and contributing to related knowledge-based multimedia standardisation activities.

K-Space brings together a world class team of 14 prominent organizations from 9 European countries with proven track records and international reputations for innovation in different but yet complementary research areas related to semantic inference for automatic annotation and retrieval of multimedia content. With a common vision of fostering bonds and developing sustainable and cutting edge research on important aspects of multimedia knowledge extraction the consortium aims at integrating currently fragmented research efforts on semantic approaches, content- and knowledge-based media engineering.

K-Space researchers have been instrumental in several standardization activities, are editors or associate editors of the most relevant related journals, have produced patents and initiated spin-out SMEs as well as several other technological achievements in knowledge-based multimedia analysis R&D.

K-Space will be coordinated by Queen Mary University of London which has a long track record in management of European projects and research in multimedia processing. The management experience has included several projects in the RACE, ACTS and IST EU programmes with consortia ranging in size up to that proposed here; such experience of ensuring satisfactory technical performance as well as management reporting will enable Queen Mary to make sure that this Network of Excellence runs smoothly and delivers the objectives described in this proposal.

B.1 Vision and Objectives of the Network

B.1.1 The NoE Vision Imperative

Currently the USA dominates most areas of science, technology and medicine in the delivery to market of innovative technology, the structure, cohesion and productivity of its research and its learned societies act as a magnet for talent throughout the world. This virtuous cycle can be seen as an example of how innovation combined with multidisciplinary research leads to high productivity and therefore guarantees a constant flow of resources for more research and innovation. While Europe has always shown pockets of first class expertise, it lacks the pull and scale of its American counterparts that makes marketing and selling of technological goods to the mass markets possible. However, given the respective population sizes, it is clear that the USA punches above its weight. The success of the USA can be emulated if certain problems in European research are addressed. This has been already demonstrated by few technologies, e.g. GSM, and there are no reasons to believe that the same could not happen with semantic inference for semi-automatic annotation and retrieval of multimedia content.

This NoE seeks to address this problem in an important area of knowledge-based multimedia analysis by focusing on a challenging, highly rewarding but yet wide open problem: The gap between the low-level content descriptions that can be computed automatically by a machine and the richness and subjectivity of semantics in high-level human interpretations of audiovisual media: The Semantic Gap.

It is arguably the fragmented nature of the European endeavour that causes it to under perform relatively. Additionally knowledge-based multimedia engineering is, by its nature, interdisciplinary. For example, it draws on semantic web technology, signal processing, linguistics, fuzzy-logic, reasoning and data mining.

This NoE aims to stimulate joint research so that within few years the European research institutes will be the primary feeding ground for industrial innovation, and Europe will have its own world class self sustaining scientific forum in knowledge-based multimedia revolving around the envisaged distributed modular Knowledge Space (*K-Space*). To ensure that the output of the targeted research becomes a main feeding ground for industrial innovation, an ***Industrial Advisory Board*** with a core of four key industrial players has been set up and has been consulted from the very outset of proposal building.

At technical level the K-Space will be an open and expandable framework for collaborative research on multimedia knowledge acquisition based on a common distributed system made up of flexible, modular and interconnected technologies. The technical developments will be influenced by an external and independent Board of Scientific Advisors consisting of eminent scientists and well-known individuals form the industry. This board will provide advice and steer the technical developments of K-Space.

At dissemination level, K-Space will foster the creation of sustainable and lasting relationships between existing national research groups targeting knowledge-based multimedia analysis. The European Workshop on the Integration of Knowledge, Semantics and Digital Media Technology (***EWIMT***) will be the flagship dissemination forum of the Network.

Within two years, the first version of the K-Space framework will be available for demonstrations of basic integrated multidisciplinary technologies. By that time the K-Space scientific forum for research and dissemination will be constituted. This forum consists of core members of K-Space, members of the Industrial Advisory Board, members of the Board of Scientific Advisors and few other key research institutions from Europe and beyond. Its mission is to coordinate and expand K-Space work at European and world-wide level. By the third year, this forum will be robust and growing and the distributed modular framework will be made available to the wider research community.

The envisaged scientific forum and the modular distributed framework will be the lasting self-sustainable legacy of K-Space to support joint research, development of inter-operating research prototypes, coordinated contributions to standards and spreading of research and technology excellence. Together these will provide a critical mass to ensure that in ten years European knowledge-based multimedia research and development can realistically be a world leading force, and have made sufficient inroads into open standards and development of the right products so that Europe is also a leader in the multimedia market.

B.1.2 Objectives

K-Space will integrate world-leading research teams from academia and industry to create a sustainable Network of Excellence in ***semantic inference for semi-automatic annotation and retrieval of multimedia content.*** The NoE will target an important and yet specific area of knowledge-based multimedia analysis by

focusing on the main failing of current multimedia annotation and retrieval systems: ***The Semantic Gap*** in multimedia processing. In this proposal the Semantic Gap is defined as:

"*the large disparity between the low-level features or content descriptors that can be computed automatically by current machines and algorithms, and the richness and subjectivity of semantics in user queries and high-level human interpretations of audiovisual media*".

The main objectives of K-Space are:

- To bring together leading European teams from academia and industry to create a lasting integration of critical mass for innovation of currently highly fragmented research groups addressing semantic inference for semi-automatic annotation and retrieval of multimedia content.
- To build an open and expandable framework for collaborative research on knowledge acquisition based on a common distributed system made up of flexible, modular and interconnected technology:
  The Knowledge Space of Shared Technology and Integrative Research to Bridge the Semantic Gap, "K-Space".
  K-Space will integrate complementary expertise, enable resource optimization and sharing, and foster innovative research in semantic inference, semi-automatic annotation and retrieval of multimedia content. It will interlink the following three main clusters of complementary but yet related technologies that so far have been growing almost in-dependently from each other. Since each one of these clusters will constitute a project workpackage in the Join Research Activities, they will be denoted by WP in the sequel.
  - Content-based multimedia analysis – WP3
  - Knowledge extraction – WP4
  - Semantic multimedia – WP5

  The networking and distributed interaction between modules and clusters will be supported by state-of-the-art database management tools, networking tools and interfaces. The integration of these tools to build the K-Space communication infrastructure will be conducted within another workpackage –WP6. Figure 1 shows a high-level abstraction of the envisaged K-Space as targeted by this seminal objective of the NoE.

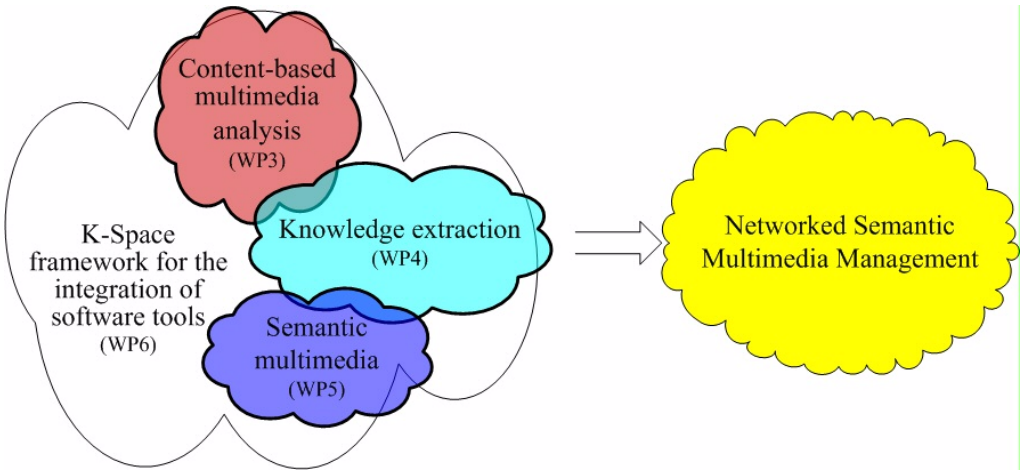


Figure 1 The K-Space framework

- To develop intelligent semi-automatic tools, i.e., tools that leverage some level of semantic knowledge extraction and that drastically reduce the workload required for annotation, K-Space aims to achieve two strategic objectives: the ambitious long-term goal of bridging the semantic gap and a short term goal of semi-automatic annotation that still requires advanced research on relevance feedback and that is potentially useful to industry in the near future.
- To ensure that the output of the targeted research becomes the primary feeding ground for industrial innovation. In order to achieve this major objective of the Network an ***Industrial Advisory Board*** with a core of four key industrial players has been set up and is being consulted from the very outset of proposal building. The Industrial Advisory Board will be expanded and become a key component of the network, if the project is funded. Its mission is to assist the network in defining research directions and advice on potential exploitation of research results as they emerge, ensuring that the targeted research does not becomes unfocused and self-serving but leads to innovative products.
- To implement an effective plan to: (a) disseminate the technical developments of the network across the broad research community; (b) provide the means to bring the results beyond the research community in a

way that appeals to the EU citizen; (c) enable the non specialist multimedia user to feedback into the K-Space technological framework; and (d) influence and contribute to related knowledge-based multimedia standardisation activities.

- To generate a durable impact by implementing an effective plan for technology transfer, training, joint research, dissemination and exploitation beyond the funded project life. This objective will be realized by establishing the mechanisms needed to create a self-sustaining scientific forum in multimedia knowledge extraction and analysis.

B.1.2.1 Specific Integration Objectives

Motivation and need: Excellent work is in progress at various research institutions across Europe. However, even the strongest proponents of these centres would agree that they cannot critically influence the direction that technological development will take on their own. For instance, research in signal processing and low-level audiovisual analysis has a long tradition and is well established in Europe, but this needs to interact with other related research fields, e.g., semantic web technology, data mining and pattern recognition, to develop the tools required to model and handle knowledge extraction and specifically to tackle the semantic gap. Here the need for a multidisciplinary approach that combines research output from different disciplines of science becomes evident.

Objectives: K-Space focuses on three complementary areas that partners believe will benefit from dedicated and strong integration efforts. The integration objectives are:

- To put forward a critical mass of research excellence in these areas within the European Community by fostering convergence and synergy on technologies being developed so far independently by distinct research communities.
- To achieve convergence and optimize resources when targeting important multidisciplinary aspects of multimedia knowledge extraction, management, modelling, sharing and use. At technical level, this will be achieved by linking research efforts over the three well defined modular and distributed knowledge technologies underpinning the K-Space framework.
- To specify, design and implement the general infrastructure for the integrative K-Space framework using, available state-of-the-art media database management tools, networking protocols and context-aware, human-centred interfaces to assist users in the exploration of multimedia content.

Measurable and verifiable results:

- Degree of researcher mobility within the Network.
- Interconnection of the development within the technological workpackages (Joint Research Activities) to share content, knowledge and network resources.
- Specification and implementation of the joint research platform defining the K-Space framework. Development of focused scenarios aimed at testing the technical implementations in real-world applications and serve as proof of concept for the model.
- Joint demonstrations of the resulting framework in key European events including the European Workshop on the Integration of Knowledge, Semantics and Digital Media Technology (EWIMT).

B.1.2.2 Specific Objectives for Joint Research Activities

At the technical level the aim is to create an open and expandable framework for collaborative research on knowledge acquisition based on a common distributed system made up of flexible, modular and interconnected technology needed to bridge the semantic gap. The joint research activities of the network will revolve around the three technological research areas: Content-based multimedia analysis; Knowledge extraction; and Semantic multimedia. The main joint research objectives of the network are:

- To study Content-based multimedia analysis tools and methodologies for low and medium-level signal processing, natural language and speech processing, multimodal techniques, high dimensionality reduction, low-level feature fusion and data mining.
- To develop and implement advanced techniques that semantic-based multimedia analysis will need, including: adaptation of existing languages, representation of extracted semantic information, multi-media context and reasoning and their integration with Semantic Web technologies to enable automatic content sharing, processing and interpretation by machines.

- To develop advanced techniques for semantic based multimedia analysis with low-level content-based multimedia processing in order to bridge the semantic gap and enabling automatic content annotation using semantic concepts derived from high-level human interpretations of audiovisual media. It includes the specification of a multimedia ontology infrastructure, knowledge acquisition from multimedia content, knowledge-assisted multimedia analysis and annotation, visual context and automatic detection of high level concepts.

B.1.2.3 Specific Dissemination Objectives

Dissemination will be achieved by the usual mechanisms of research papers but also by issuing training material and tutorials on key topics. So, as well as research papers, each site will contribute tutorial material so as to allow others to have ready access to developments in knowledge extraction, management, modelling, sharing and use, not just within the NoE, but worldwide. These contributions will be combined into coherent courses targeting chosen topics and offered at different locations in Europe. The NoE intends to use this material to prepare a joint distance learning course that will be linked into Masters courses at many of the contributing universities when the project is finished. A thematic book to support distance learning will be published at the end of the funding period. Several dissemination forums, standardization bodies, international conferences and exhibitions have been already identified by the consortium. The European Workshop on the Integration of Knowledge, Semantics and Digital Media Technology (EWIMT) has been identified as the main yearly event of the Network.

An important dissemination goal is to allow the non specialist citizen access to the outputs of the technology that is being developed. The aim is to establish at an early stage main interest of end users. This will provide feedback on the technical developments of the NoE and contribute to the success of the research, hence to the sustainability of the NoE. This particular dissemination objective will be linked to the development of focused scenarios aimed at testing the technical implementations in real-world applications and serve as proof of concept for the K-Space model.

Another objective is to influence and contribute to related knowledge-based multimedia standardisation activities. Since consumers react positively to interoperability, industry has become more interested in standards. The development and successful marketing of the targeted technology in Europe will need clear and well thought out standards. Using the expertise within the NoE to assist in the creation of standards that allow European industry to flourish would be an important objective of K-Space.

B.1.2.4 Sustainability and lasting impact

The envisaged durable impact will be assured by establishing and implementing the mechanisms needed to create a world class self-sustaining scientific forum in multimedia knowledge extraction and analysis aiming at stimulation of research and acting as the primary feeding ground for industrially innovation, with its own monthly electronic newsletter, conference (EWIMT) and well established industrial relations.

K-Space will also have a durable impact by creating mechanisms for technology transfer and training. Its legacy will be a much better informed community through dissemination, where SMEs in particular will be targeted, a more highly skilled community through technology transfer, a set of state of the art open source tools to support multimedia knowledge extraction; and a set of techniques and tools in the market place. Linked with technology transfer, SMEs and industrial institutions will be approached and encouraged to send employees to visit centres for periods so as they can share and contribute with the work at the centre. Each site will also contribute private consultancy, particularly targeted to SMEs.

Additionally, each of the K-Space members has mechanisms to encourage and support the establishment of spin-off companies to exploit new research ideas and joint IPR with other institutions in the NoE . These support departments have experience in how to patent ideas and how to protect foreground knowledge. It is planned to use these facilities to support the joint exploitation of new ideas to create a revenue stream that lasts long after the project has finished. In this activity the NoE forum of industry will play a crucial role.

K-Space partners will automatically become long terms members of the envisaged scientific forum. This has been set as requirement in a signed letter of commitment. This rule will ensure that the consortium continue cooperating and sharing resources and developments beyond the funding period.

B.1.3 Human Resources Dimension of the Network

The core of the network will integrate **85** full-time researchers and **70** doctoral students. Table 1 gives a list of names and affiliation. The gender of the researcher is given in brackets (F/M).

Table 1 Human resources dimension of K-Space

Participating Organization (Short Name)		Name of full-time researchers		Name of doctoral students	
1	Queen Mary, University of London (QMUL)	Prof. Ebroul Izquierdo	(M)	Marta Mrak	(F)
		Prof. Mark Sandler	(M)	Divna Djordjevic	(F)
		Dr. Eliane Bodanese	(F)	Jenny Zhang	(F)
		Dr. Yue Chen	(F)	Maria Trujillo	(F)
		Dr. John Bigham	(M)	Andres Dorado	(M)
		Dr. Alan Pearmain	(M)	Ke Ren	(M)
		Rachel Stoneley	(F)	Naeem Ramzan	(M)
		Dr. Mike Davies	(M)		
		Dr. Raul Mondragon	(M)		
2	Koblenz University (KU)	Prof. Dr. Steffen Staab	(M)	Sahla Bouattour	(F)
		Prof. Dr. Dietrich Paulus	(M)	Vinh Hong	(M)
		Prof. Dr. Ulrich Furbach	(M)	Oliver Obst	(M)
		Jun.-Prof. Bernhard Beckert	(M)	Johannes Pellenz	(M)
		Prof. Dr. Klaus Troitzsch	(M)	Christoph Ringelstein	(M)
		Dr. Carlo Simon	(M)		
		Dr. Andreas Winter	(M)		
3	Joanneum Research Forschungsgesellschaft mbH (JRS)	Werner Haas	(M)	Werner Bailer	(M)
		Georg Thallinger	(M)	Michael Hausenblas	(M)
		Dr. Herwig Rehatschek	(M)		
		Peter Schallauer	(M)		
		Dr. Helmut Neuschnmied	(M)		
		Gert Kienast	(M)		
		Karin Rehatschek	(F)		
4	Informatics and Telematics Institute (ITI)	Prof. Stefanos Kollias	(M)	Vassilis Tzouvaras	(M)
		Prof. Michael Strintzis	(M)	Vassilis Mezaris	(M)
		Dr. Yiannis Kompatsiaris	(M)	Stamatia Dasiopoulou	(F)
		Dr. Yannis Avrithis	(M)	Thanos Athanasiadis	(M)
		George StamouKosmas	(M)	Vaggelis Spyrou	(M)
		PetridisVasileios Papastathis	(M)	Nikos Simou	(M)
5	Dublin City University (DCU)	Dr. Noel O'Connor	(M)	Jovanka Malobabic	(F)
		Prof. Alan Smeaton	(M)	Georgina Gaughan	(F)
		Dr. Noel Murphy	(M)	Sinéad Mc Givney	(F)
		Dr. Sean Marlow	(M)	Sandra Rothwell	(F)
		Dr. Gareth Jones	(M)	Colm Foley	(M)
		Herve LeBorgne	(M)	Michael Blighe	(M)
		Cathal Gurrin	(M)	Ciaran O'Cannaire	(M)
6	Centrum voor Wiskunde en Informatica in Amsterdam (CWI)	Prof. Lynda Hardman	(F)	Kateryna Falkovych	(F)
		Jacco van Ossenbruggen	(M)	Joost Geurts	(M)
		Lloyd Rutledge	(M)	Stefano Bocconi	(M)
		Frank Nack	(M)		
7	Groupe des Ecoles des Télécommunications (GET)	Dr. Gaël Richard	(M)	Olivier Gillet	(M)
		Dr. Bertrand David	(M)	Valentin Emiya	(M)
		Dr. Francois Yvon	(M)	Pierre Leveau	(M)
		Dr. Marine Campedel	(F)	Chloé Clavel	(F)
		Dr. Ioana Vasilescu	(F)	Thomas Hurtut	(M)
		Dr. Gerard Chollet	(M)	Miguel Alonso	(M)
		Prof. Francis Schmitt	(M)	Slim Essid	(M)
8	Institut National de	Daniel Teruggi	(M)	Rémi Landais	(M)

	l'Audiovisuel (INA)	Vincent Brunie Jean Carrive Laurent Vinet	(M) (M) (M)	Jean-Philippe Poli Marc Caillet	(M) (M)
9	Institut Eurécom (EURECOM)	Prof. Bernard Merialdo Benoit Huet Dirk Slock Jean-Luc Dugelay Christian Wellekens Christine Lisetti	(M) (M) (M) (M) (M) (F)	Fabrice Souvannavong Joakim Jiten Eric Galmar Mahdi Triki Youssef Fakhro Teodora Erbes	(M) (M) (M) (M) (M) (F)
10	University of Glasgow (GU)	Prof. C. J. Van Rijsbergen Dr Joemon M. Jose Dr Iadh Ounis Dr Mark Girolami Phil Gray Dr Paul Cockshot	(M) (M) (M) (M) (M) (M)	Jana Urban Reede Ren Srikant Jakilink Sumitha Balasurya Sachi Arafat	(F) (M) (M) (M) (M)
11	German Research Centre for Artificial Intelligence (DFKI)	Thierry Declerck Paul Buitelaar Melanie Siegel Marc Schröder	(M) (M) (F) (M)	Fabrice Souvannavong Mihalea Vela Alexander Schultz Mirjam Kessler Daniel Sonntag Elsa Pecourt	(M) (F) (M) (F) (M) (F)
12	Technische Universität Berlin (TUB)	Prof. Dr. Peter Noll Prof. Dr. Thomas Sikora Dr. Kai Clüver Dr. Ronald Glasberg Tilman Liebchen Lutz Goldmann Markus Schwab	(M) (M) (M) (M) (M) (M) (M)	Sebastian Knorr Matthias Kunter Martin Haller	(M) (M) (M)
13	Ecole Polytechnique Fédérale de Lausanne (EPFL)	Prof. Touradj Ebrahimi Prof. Sabine Suesstrunk Dr. Yousri Abdeljaoued Dr. Frederic Dufaux Dr. Gary Garcia	(M) (F) (M) (M) (M)	Elisa Drelie Ulrich Hoffmann Yannick Maret David Marimon Mourad Ouaret Olivier Steiger	(F) (M) (M) (M) (M) (M)
14	University of Economics, Prague (UEP)	Dr. Vojtěch Svátek Prof. Petr Berka Dr. Jan Rauch Dr. Vilém Sklenák Dr. Petr Strossa Dr. Miroslav Vacura	(M) (M) (M) (M) (M) (M)	Martin Labský Martin Kejkula Jan Nemrava Vladimír Laš Martin Kavalec Marek Růžička	(M) (M) (M) (M) (M) (M)

B.2 Relevance to the objectives of the IST Priority

B.2.1 Relevance to Strategic Objective 2.4.7 (Semantic-based Knowledge and Content Systems)

The K-Space project is directly aligned with the objectives of IST in the sixth framework programme. The K-Space NoE will be one of the mechanisms to allow Europe to acquire a leadership role in methods of derivation, application, and exploitation of knowledge as applied to content processing, communication and consumption, which are technologies central to the knowledge economy.

The IST strategic objective addressed for K-Space is the one concerned with semantic-based knowledge and content systems (2.4.7). Fundamental to this strategic objective is the acquisition and manipulation of multimedia content. Such content will increasingly be available across different modalities and subject to interaction via speech, gesture, feel and touch, and other senses. Many of the processes, interactions, and objects described in that objective are dependent on the semantics and context. That is, to acquire, model, navigate, retrieve, represent, visualise and make use of shared knowledge effectively depends on capturing the semantics of media objects in context. The objective of K-Space consortium is to develop techniques and tools for the semi-automatic annotation of multimedia content and its retrieval in context.

More specifically, although description of multimedia information has recently seen significant progress, the pace of automatic extraction of such a description, and especially of its semantic part, is rather slow and still remains an open issue. On the other hand, considerable achievements have been made in speech/text-based/ontology/semantic web knowledge representation, extraction and management techniques. A main novelty and objective of the work in K-Space is to bring these two communities' work together and develop a common knowledge representation framework for as automated as possible and efficient knowledge acquisition and modelling for multimedia content. This will result in automatic semantic metadata extraction and annotation, indexing and retrieval of multimedia content. It will also contribute to the maturity of the intelligent content vision. The diversity, complexity and multidisciplinary nature of this topic requires experts from fields such as signal processing, natural language processing and understanding, pattern recognition, knowledge representation and human factors engineering, complementarily represented in the K-Space consortium. Developing robust, flexible, and efficient solutions to this problem is perhaps the single most important and significant research challenge currently facing the multimedia analysis community for many years to come.

Successful resolution of these matters will allow more efficient and user-friendlier access to all forms of data and will improve data accessibility for all. Today, multimedia technology has expanded to encompass all facets of our daily lives - at work, at school, at home for leisure and learning and on the move - and it is reaching ever-widening segments of society. The Internet, e-mail, mobile phones, etc. are already standard channels for Europe's information society to communicate, gain access to new multimedia services and to learn new skills. Entrepreneurs are using multimedia and need new knowledge-based access technologies to improve their competitiveness and create new business opportunities.

By basing its research objectives emphasis on the user, the proposed research will develop new ways of interacting with and consuming audio-visual content. When attempting to locate and consume specific content, users (enterprise, institutional) think in terms of higher-level semantics such as the places and "things" the content depicts and how they are expressed in language. They do not think in terms of how these places and "things" are represented. Thus, during an annotation process, it is desirable to present the content to the user in terms of these higher-level semantics, thereby facilitating fast and intuitive indexing and avoiding a lengthy, complex and expensive manual process.

B.2.2 Relevance to the Technological Integration Goals of FP6 and Workprogramme

The main goal of our project, the overcoming of the semantic gap, is an essential prerequisite for a success in the objective 2.4.7 (Semantic-based Knowledge and Content Systems) of FP6 work programme for 2005/2006. The task of this objective is "*to develop semantic-based and context-aware systems to acquire, organise, personalise, share and use the knowledge embedded in web and multimedia content. Research will aim to maximise automation of the knowledge lifecycle and to achieve semantic interoperability between heterogeneous information resources and services, across content types and natural languages. To pioneer intelligent content, which will be self-describing, adaptive to context and user information needs, and exhibit*

a seamless interaction with its surroundings and the user." (from http://www.cordis.lu/ist/so/knowledge-content/home.html).

The required maximization of automation is identical to a minimization of manual operations conducted by human operators. The most important step in current multimedia content processing and storage systems which requires manual processing by humans (since there is no satisfactory automatic solution) is the classification or labelling of multimedia content. During this processing step the high-level semantic meaning is derived from the low-level multimedia data. This could be for example the indexing of a personal video library in categories like records of sportive events, certain TV series, holiday records, marriage records and so on.

Such a classification is essential for the maintenance and usage of any bigger library of multimedia data as anyone could see from the example of a common library for books, which could be seen as a special case of a multimedia library with heavy human involvement. In a full-automated library computers should have the same responsibilities as a human librarian: categorizing new arrivals, finding matches based on a high-level description of the content (e.g. spoken language) etc. For these tasks an at least basic recognition of the high-level content is indispensable. As mentioned above, current implementations of such systems still require at least a manual tagging of new media files. This becomes unhandy if not impossible for the growing amount of media data produced, altered and consumed today.

Actually there is a fairly huge gap between the semantic meaning / abstraction level of the descriptions needed for such an indexing and the semantic level of current MPEG-7 low-level descriptions automatically derived by computers, the semantic gap. Overcoming this gap would be a challenging task spanning the domains of many research fields - from signal processing for signal denoising and derivation of robust low-level-features up to information processing aspects of classic computer science - and therefore a good choice for a Network of Excellence.

The wide area spanned by the experience and knowledge of the participants promises a successful processing of the task, especially when considering the amount of knowledge and experiences on the subtasks necessary to solve the problems.

An additional benefit of such a reasonable cooperation would be a natural integration of research efforts as expected by FP6 guidelines for Networks of Excellence in general. Since this research domain is a very new but important topic for next generation information technology, the ongoing of these structures of cooperation beyond this initial project is very likely - especially when taking the relatively small amount of redundancy in the research fields of the participants regarding the project goal and the high public and commercial interests in such a technology into account.

B.2.3 Relevance to main targets of IST in FP6

Being a Network of Excellence K-Space' main contribution is to "*facilitate the aggregation of public and private research effort on a European scale and enable the development of a European Research Area (ERA) in IST*". This is reached by bringing together 14 renowned research organisations which are active in three different fields up to now only peripherally connected. These three areas are **multimedia content analysis**, **multimedia knowledge extraction** and **semantic multimedia**. By bringing together these three fields the most problems should be overcome closing the **semantic gap** between information provided by low-level automatic multimedia processing currently and the high level semantics buried in the multimedia content. The aggregation of research effort on an European scale is enabled and supported by developing and supplying a common software-infrastructure allowing directly using and exchanging research results from the different fields. This is accompanied by an ambitious program of scientific exchange (use of common tools and data, academic and industrial researcher exchange, joint conferences, seminars and curricula).

By providing algorithms to closing the semantic gap high level information could be extracted from multimedia content which in turn enables to implement "*future generation of technologies in which computers and networks will be integrated into the everyday environment, rendering accessible a multitude of services and applications through easy-to-use human interfaces*". The human interfaces will be easier to understand as the information to be provided by the user (e.g. in formulating a query) as well as information provided to the user with its higher semantic level is directly related to the personnel knowledge of the user and her experience. This also "*places the user in the center*" and not the application (needing currently low-level information hardly to provide and interpret by the user).

Overall results of K-Space will make media creation cheaper, by enhancing the quality of content annotation at the same or lower price point and such enabling wider content reuse as suitable content is easier to find. K-

Space will contribute to standards that make technology adoption safer for the purchasing industries. Industry standards in the description of media content will be critical in allowing the innovation emerging from the NoE to be adopted on a large scale across multiple platforms. To achieve this, K-Space researchers will use the understanding developed during the project to contribute to key standards bodies and industry forums to ensure meaningful and useful standards for describing content are developed in lines with the needs of the industry. All this contributes to the goals of the e-Europe action plan.

B.2.4 Societal and economic challenges

There are a variety of societal and economic challenges which K-Space addresses. These challenges concern the overabundance of available content, coupled with the lack and dispersed nature of available knowledge based technology to structure and handle it. Furthermore, there is little trust in the few existing content management tools, and these tools have not yet led to sustainable growth for the small businesses that could use them. This is even more significant in applications related to leisure and entertainment where terabytes of information is available in an unstructured form and indexing and retrieval tools are urgently needed.

In order to tackle the proliferation of non-indexed or non-annotated content, innovative and original data mining tools will be created and applied. These will have the ability to define associations between different types of media. In addition the Joint Research Activities of K-Space target the development of semantic-based management tools to enable professional creators, providers of entertainment services end end-users to manage and retrieve information.

To ease problem solving in many areas of science and society, the Joint Research Activities of K-Space address innovative content management and information filtering using knowledge based technology. This supports remote sharing of expertise between professional and end user. User satisfaction will be increased by providing end-users with enhanced quality of experience in multimedia applications through the range of potential innovative services originated by the outcomes of the NoE research. K-Space aims to integrate research efforts across Europe to improve annotation and retrieval of multimedia content and to produce well-structured content for all players in the multimedia industry. As stated in section B1, research on semantic inference for semi-automatic annotation and retrieval of multimedia content research is dispersed across Europe. K-Space will provide a self-sustaining network for integration, dissemination of results, technology transfer and training. By providing open source tools and techniques, this serves to create a highly skilled and more competitive European society.

B.3 Potential impact

B.3.1 Industrial Impact

Bridging the semantic gap in multimedia content processing makes it possible to provide higher level semantic information with less cost. This is viable for lots of business applications dealing with multimedia content; e.g. broadcast, media production, media monitoring and alike.

The recent PrestoSpace survey estimated that the total European holdings of audiovisual content amount to over 100 million hours. As well as being intrinsically valuable in a heritage and historical context, this repository also represents a significant financial asset. For example, it is stated in a recent EBU archive report, that the BBC, as part of an accounting exercise, valued its archive at €714 million based solely on the costs required to physically replace it were it to be destroyed. Clearly, these holdings represent a significant asset for both broadcasters and the general public alike. However, in order to achieve the real potential of these archives, there are a number of obstacles to overcome. One of these is the sheer volume of effort required for cataloguing this information store. The EBU report estimated, based on members' experiences, that a time ratio of 1:8 for TV material and 1:3 for radio material can be applied to the task of cataloguing. In practice, this means that a three hour program could feasibly take three working days to catalogue. Furthermore, depending on the granularity of cataloguing required, this can scale up to a ratio of 1:24! Research advances such as those proposed in K-Space can only serve to improve these ratios. In addition to savings during the cataloguing step further advantages could be realised on the base of the high-level semantic annotation as search times decrease and content is more easily found and thus more often reused.

Based on the higher quality information provided by K-Space new forms of media production (especially automated content assembly) could be developed and introduced. By giving European media professionals first sight of the new capabilities and by working with them at the innovation level to enable the programme ideas that can only be imagined today, K-Space can stimulate the creation of valuable knowledge-based assets that will bring wealth into the European Union.

Endemol, the Dutch originated entertainment company, for example owns some 500 programme formats and has annual revenues of nearly € 0.9bn. New, truly innovative formats enabled by K-Space could thus create significant wealth coming into Europe based on knowledge-based assets.

Looking at the current developments in media (proliferation of channels, higher number of media formats – probably with narrower more focused targeted audience) from the media monitoring point of view it is apparent that the current workflow applied will get more and more infeasible. This together with increasing demand for fast, accurate, detailed and relevant information, and the corresponding increase in the availability of information, it is imperative that especially executive managers and decision makers (usually people very limited in time) are able to quickly access, interpret and utilize relevant information – not only related to one medium but to a number of different media such as radio, web, TV material and so on. This fast and accurate aggregation of and access to broadcast information and content will allow European information providers and consumers to defend and improve their existing market positions against non-European companies. For media information companies results of K-Space will enhance productivity as fewer operators are needed to monitor the same number of channels and providing more accurate information. Additionally the time-to-information will decrease and it will be easier to repurpose the extracted information. All this enables possibilities to create new business opportunities.

K-Space will also enable the development of new personalised services for e.g. iTV. The higher level semantic information could more easily be combined with user-profiles thus allowing more targeted information of the user or aggregation of information for a user.

B.3.2 Strengthening S&T excellence in Semantic-based Knowledge Systems and Durable Impact on European Research

Status quo: Scrutinizing the scientific & technological status quo of multimedia systems, the semantic gap between current engineering practice and the human user is striking. Considering the broad range of current devices and formats such as MMS, DigiCams, DVDs, etc. it is obvious that this gap may either widen and will leave its users without an appropriate solution, in fact enforcing the digital divide between technology expert users and technology detesting users. At the level of business development this marks a possibility for businesses to create and exploit such technology as well as for commercial users to optimize their processes

involving multimedia data (including diverse fields such as production engineering, publishers, e-health, etc.).

At the level of scientific research, one may recognize a wide set of efforts in order to diminish the semantic gap. These efforts may be characterized by "belonging" to one of two communities:

- The multimedia community develops standards like MPEG-7 and MPEG-21 that are tailored according to what conventional multimedia analysis may provide. The disadvantage of such efforts is that lessons learned in the knowledge representation community have been disregarded and the objectives pursued are either overly optimistic - expecting higher order belief representation, such as formulated in the goals of MPEG-21 - or overly pessimistic - restricting the re-use of data, because it is foreseen to be used only in one particular context rather than as a general means to represent and access multimedia content.
- The semantic technology community has developed means for handling semantic metadata that are ideal for pure knowledge representation systems, but which lack support for the special capabilities and needs of multimedia technologies. OWL is here a good example as it allows for an expressive definition of concepts – while it does not provide simple means to contextualize propositions in a standardized way, e.g. to represent that a picture depicts Schuhmacher winning a car race.

Thus, one may recognize that even when considering the situation from a shallow perspective the trenches between multimedia and semantic technologies run very deep and, in fact, more trenches exist when one considers the different subtasks that underlie a whole framework of semantic multimedia analysis and management. The reason for this fragmentation lies in the fact that these two technologies are inherently complex to master on their own. Both technologies on their own need groups of experts to achieve progress in the field – hence, coordination of efforts and coordination of research is needed even more so when the two need to be combined to close the semantic gap. Within the research framework described in this proposal an additional research community with strong ties to the other two is considered: Knowledge extraction. The ultimate goal is to foster the links between content-based multimedia, knowledge extraction and semantic multimedia analysis in order to overcome current barriers between multimedia and semantic technologies.

It is the core objective of K-Space to bring together the groups of experts from the fields of multimedia and semantic technologies to let the combined expertise flourish for the purpose of excellent scientific progress and new technologies with high potential for business opportunities.

Strengthening Scientific Excellence: Europe has a unique position in the scientific field of semantic technologies, where many of its core proponents come from Europe. For instance, Europe was at the forefront of developing OIL/OWL, at the forefront of the Semantic Web overall and a clear sign for this dominance is the fact that at the premier Semantic Web conference of last year, ISWC-04 in Japan, the number of European papers accepted outnumbered the American ones by a ratio of about 2:1. Though this is a solid starting point concerning the foundations of semantic technology, research on semantics is not done for the sake of its own, but in order to enable new possibilities for human-computer interaction or computer-computer interaction, such as multimedia management, knowledge management or e-business. Research in these areas has traditionally been a stronghold of research outside of Europe, such as the US or Japan. Notwithstanding European successes, scientific results leading to standards in these application areas and later on to products have been produced predominantly outside Europe.

At this point in time, the big challenge for semantic multimedia systems and the bridging of the semantic gap is the problem of overcoming the community divide between experts in high-level knowledge representation and experts in high-performance multimedia management.

Thus, there exists a great chance to corner scientific excellence in the areas of Semantic Web and Multimedia in order to achieve fast scientific progress.

K-Space seizes this unique opportunity by addressing the mutual needs of semantic technologies and multimedia from its both ends bringing a selection of the best researchers on the Semantic Web and multimedia together in the K-Space NoE.

Strengthening Technological Excellence: Semantic technologies as well as multimedia technology can rarely be provided out of the box; the beneficial application of both technologies typically needs expertise, which cannot be created by scientific progress alone, but which must be complemented by technological excellence, such as won by concrete implementations, contributions to standards, ongoing developments of software and training of early adopters and students. Therefore, the K-Space consortium does not only forge a network of scientific excellence, but also one of technological excellence, the research results of which come with a larger framework for implementation. The needs of the user and of industry are fed into the

network by close contacts with the industrial advisory board. The network foresees various mechanisms to train early adopters and students in order to build up a European community of technology experts in semantic technologies and multimedia.

Sustainable Impact: The K-Space NoE has been crafted in order to create a lasting impact with regard to scientific and technological excellence in Europe. To achieve this impact, its objectives include:

- Development of a reference framework
- Contribution to standards, influencing subsequent development
- Installation of new educational cross-European programmes that outlast the funding phase

B.3.3 Impact on SME's

Linked with technology transfer, SMEs will be encouraged to send employees to visit centres for periods so as they can share and contribute with the work at the centre. In particular they can learn how to use the ideas and tools being developed. Each site will also contribute private consultancy, particularly targeted to SMEs, so their problems can be addressed. All K-Space partners have strong links with other institutions outside the consortium and a number of spin-off companies originated in the past by consortium members. Spin-offs SMEs include: Insonify and Qmedia – spin-offs of QMUL; Emitall S.A – spin-off of EPFL; Ontoprise GmbH, Germany and wizAI-Solutions GmbH, Germany – spin-offs of KU; Oratrix – spin-off of CWI; HS-Art digital Service GmbH and doors2knowledge GmbH – spin-offs of JRS. SMEs in close collaboration with the participating teams will be approached and asked to host K-Space researchers' on short-term visits. The NoE participants expect this activity to foster industrial links and to help researchers to become familiar with real-world problems and means to tackle them.

K-Space will enable small content owners and aggregators to launch services to a wider audience and lower costs. The technology the project represents will make it possible to introduce compelling services with fewer resources. With the automatic generation of semantic metadata, K-Space will drastically reduce the cost of publishing and distributing content; hence make it possible for small actors to launch profitable services. It will also enable niche content owners to reach more end users and evolve new markets and business models as well.

If the results of the NoE or part of it will be open source, a market for technology companies will also open. Since the nature of K-Space is so distributed it will allow many different implementation of the technology. It covers a wide range of technology from distribution, access to content management. A new market for companies in the different technology segments of the project may open up and new companies can feed on the market adoption of the system.

B.3.4 Impact on Trans-European Education Master programs, EU degrees and Multi-Disciplinarity

Following the resolutions of the formation for Education, Youth and Culture (EYC) of the European Council the way ahead requires a tighter integration of research, education and practice. The integration of research and education in the spirit of Alexander von Humboldt has become a supporting pillar of today's education principles world wide. Further improvements lead to a better, synergetic cooperation between academic research and industrial practice. Especially the new uniform European bachelor/master program would benefit from early contacts with real practical experiences outside of the classic academic system since especially bachelor students need such experiences much earlier than students in classic engineer study courses. Integrative projects like K-Space would provide the opportunities for such contacts and would therefore not only strengthen the research activities but the quality and relevance to practice of the academic education too.

Services based on semantic inference for semi-automatic annotation and retrieval of multimedia content require an interdisciplinary approach which should bring together scientific communities from different domains. K-Space will contribute towards this goal. More specifically, it calls for partners with different background and expertise including semantic web, human computer interaction, image and video processing and analysis, and content indexing and retrieval. For European education potential Masters programmes originated in this NoE will have a long term impact.

We estimate that by 2006 Master programs in which K-Space partners are involved will train up to 800 Masters students a year.

Several of the institutions already offer distance learning and have facilities to initiate the programme. Relevant synergies with education at all levels will be set out and K-Space partners will be instrumental in this. The following are selected examples of relevant educational involvement of K-Space partners.

The Department of Electronic Engineering at QMUL specialises in Information Technology, in which area knowledge based multimedia processing features very prominently. Multimedia Applications, Internet Security and E-Commerce are expanding areas for the Department. As a consequence, the Department is now attracting around 200 new postgraduate students annually. This project will provide QMUL with a possibility to extend its expertise and the knowledge gained from the project will ensure that the content of QMUL's final year degree courses and its postgraduate courses is kept abreast of current and forthcoming developments in the Multimedia area. In particular, the Department has set up a new Master course in Multimedia Systems Technology. The results of this project will feed directly into this course. This will enable QMUL to extend its research profile and will also be invaluable in the context of its educational work.

Specialised in the field of Information Technology, the Groupe des Ecoles de Telecomunications current development plans call for a 50% increase in size over the next four years. The place of multimedia in the broad array of activities of GET is gradually increasing and the attractiveness of this area is receiving a continuously growing interest from our students. Although a strong cooperation for education is in place between the different graduate schools of GET, all of them have already a well established network with other European institutions. For example, ENST (Télécom-Paris) has joint degree agreements with five partner institutions in different European countries and agreements with a number of other institutions to provide the students with the possibility of completing their diploma requirements for ENST by enrolling independently in a recognized M.Sc. programme. As another example of already established cooperation at the European level, Eurecom institute, one the Graduate schools of GET was co-founded with EPFL and is now administered by a consortium of European academic and industrial partners. Clearly, K-Space will help to strengthen and extend such cooperation especially in the field of multimedia.

Dublin City University is fully committed to working with other academic institutions within the K-Space NoE in order to develop new trans-European education initiatives in the field of cross-media. The University already has a number of initiatives in place allowing remote access to undergraduate and postgraduate programmes as well as having formal agreements in place with a number of EU universities for exchange of students, whereby the results of modules undertaken in DCU constitute a formal component of an academic award in the collaborating university. These existing agreements and initiatives will be used as a spring-board for development of similar activities with K-Space partners. Many of the practical mechanisms required for trans-European education initiatives are already in place in DCU. For example, in recent years, the School of Electronic Engineering has launched a postgraduate programme entitled RACeE - Remote Access to Continuing Engineering Education[1]. These courses have a total of almost 200 registered students annually. The M.Sc. in Technical eCommerce can trace its roots back to EUROIEMASTER (IE2012) project (Towards the Development of European Education and Training Qualification in Information Engineering), a horizontal RTD activity in Information Engineering as part of the EU FP4, finished in 1997.

The Department of Computing Science, University of Glasgow have initiated an integrated MSC programme and advanced MSc programme from October 2004 onwards. The idea of this course is to train students at an advanced level in various fields of computing of which multimedia is an important area. It is expected that students from Europe and the rest of the world would undertake this course. The K-Space activities and especially the distance learning modules would be a real benefit for this course by providing advanced techniques by leading experts from Europe. This will allow us to train the students on latest in the field and thus increasing the quality of the output and thus increasing our research and teaching profile.

DFKI has a technology transfer agreement with the Saarland University, more specially the Faculty of Informatics and the Department of Computer Linguistics. The Department of computer linguistics is involved in an International Graduate College, dedicated to Natural Language, Perception and Cognition. DFKI would investigate how research work in K-Space could be integrated in this Graduate College. DFKI also has good connections with Sympalog Gmbh, a successfull spin-off of DFKI in the domain of voice applications.

[1] www.racee.ie

B.3.5 Contributions to standards

With a view to bringing new functionalities with reduced cost, increased performance and more flexibility and easiness, the K-Space NoE will aim at contributing to existing and emerging standards. It is now widely recognised that the standardization of a new technology is beneficial to the industry and to the end-user. This is the reason why K-Space will invest significant efforts into standards activities and will contribute wherever and whenever possible.

This project is tackling several topics which are currently under consideration by ISO/IEC JTC1/SC29 WG 11 (MPEG), WG1 (JPEG) as well as XML, XML Namespaces, RDF, XSL, XSLT (W3C) standard bodies. An objective of K-Space is therefore to actively participate and contribute to these standardisation activities with the expectation of having a significant impact on the development of these standards.

K-Space will address important standardization issues such as content description (metadata), user preferences and content adaptation, which are in the scope of MPEG-7 and MPEG-21. As an early adopter of MPEG-7 and MPEG-21, the NoE will therefore build know-how in these fields and will be able to contribute new technologies along the road.

Joanneum Research (JRS) is an avid user and supporter of MPEG-7. In past projects a comprehensive API for MPEG-7 has been implemented and made publicly available (MPEG-7 library: http://iis.joanneum.at/MPEG-7). Based on this API a media repository focusing on content based indexing and retrieval has been implemented. As a result of the experiences JRS proposed the “Detailed Audiovisual Profile”. In the course of K-Space it is expected that a number of new descriptors and description schemes as well as profiles suited to certain application areas will be developed and actively contributed to ongoing MPEG-7 standardisation activities. JRS also focuses on industry standards directly linked to media production like MXF and AAF. Results of the project will – where suitable – be introduced in the appropriate working groups.

JPEG has recently started a new work item, JPSearch, to standardize technology for indexing, search and retrieval of JPEG 2000 images. The Ecole Polytechnique Fédérale de Lausanne has been one of the initiator of this new activity and will continue its involvement in the future. It will also be a liaison between JPSearch and the MPEG-7 group, as these two groups are considering similar issues.

DFKI contributes, also within the eContent project LIRICS, to standardisation activities within the ISO TC37/SC4 committee dedicated to language resource management. The link between standards for language resources and MPEG-7/MPEG-21 will be one of our main concerns. DFKI is also contributing to the ISO TC37/SC4 Task Domain Group (TDG) on multimodal semantic representation.

Technische Universität Berlin is a main contributor to current MPEG-4 ALS (Audio Lossless Coding) works (see http://www.nue.tu-berlin.de/research/projects/lossless/mp4als.html). It also contributes to ISO MPEG-7.

CWI is a contributor to the W3C SMIL 1.0, SMIL 2.0, and XHTML recommendations and as well as to ISO’s MPEG7 DDL Working Group. CWI is currently participating in the W3C Semantic Web Best Practices group which aim is to provide hands-on support for developers of Semantic Web applications. This involvement will greatly contribute to WP4 that builds a reference architecture that will be used throughout the K-Space project.

Several research activities that will build on semantic web layer structure start with Unicode, the URI and namespace (NS) syntax and XML/XML Schema. The Resource Description Framework (RDF) in which KU has been strongly involved is used to make simple assertions about media resources or any other entity that can be named, while RDF Schema (RDFS) extends RDF with class and property hierarchies that enable the creation of simple ontologies. Finally, the Ontology layer features OWL (Ontology Web Language) which is a family of richer ontology languages (OWL Lite, OWL DL, OWL Full). These standards will be also targeted in K-Space activities. XML standards (e.g., XML, XML Namespaces, RDF, XSL, XSLT) are defined at a breathtaking speed. It is a de facto standard for data representation and exchange. This standardisation activity is done by the W3C. Such activities are organised into various working groups. Several partners in the K-Space consortium are involved in such activities. K-Space will strengthen and support partner’s participation in such activities and contribute to the development of future XML standards.

B.4 Degree of integration and the Joint Programme of Activities

The project consists of seven workpackages (WPs). WP1 is dedicated to the coordination activities. The division between the other six WPs has been chosen to group activities and skill types required to implement the strategic objectives of the NoE as well as the clusters of advanced knowledge and media processing technologies defined in section B.1.2. While WP2 and WP7 are dedicated to the Integration and Dissemination activities, two main strategic objectives of K-Space, the other four WPs group all the R&D activities of the Network. As shown in Figure 2 the Jointly Executed R&D activities of K-Space (JRA) are the backbone of the Network. The JRA are embraced by the two WPs dedicated to integration and excellence spreading. The strategic objective of sustainability and lasting impact is embedded in several activities across the seven WPs of the project. Figure 2 shows the interconnections between WPs. Interaction will also be required at activity and sub-activity level, particularly where R&D work is concurrent or dissemination activities are needed to spread excellence and to disseminate specific research results. In subsection B4.1 all activities in the project are summarized. A more detailed description of each activity, corresponding sub-activities and the partners participating is given in the next sections.

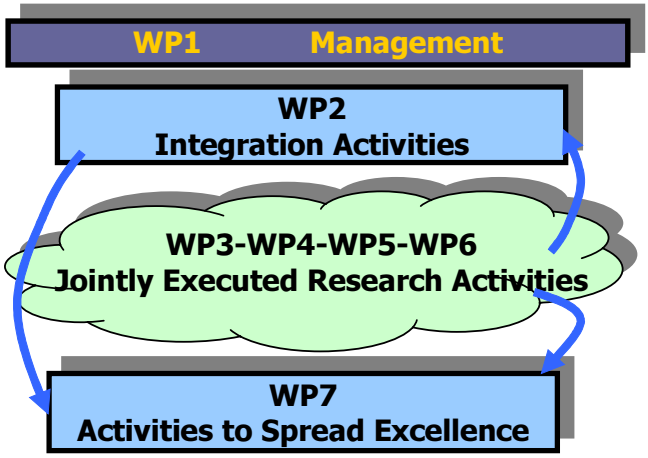


Figure 2 WP structure and interrelation with the main activities

Integrating activities - WP2

The purpose of the integration activities in K-Space is the creation of sustainable and lasting relationships between partners and the growth of interdisciplinary collaborative research aligned with the project's research objectives. The planned integration activities will create new inter-disciplinary links and bonds between partners not possible via other routes. As a result of these activities, the combined interdisciplinary excellence and growth of the entire NoE will increase substantially. Integration is targeted at different levels according to the following specific activities:

Activity WP2.1: Exchange of Academic Research Personnel
Activity WP2.2: Industrial Placement of Research Personnel
Activity WP2.3: Shared Teaching Resources
Activity WP2.4: Dissemination to the Non Specialist Citizen
Activity WP2.5: Monitoring and Evaluation of Integration Activities

Joint Research Activities - WP3, WP4, WP5 and WP6

K-Space Joint Research Activities are embraced by four WPs. The focus is on collaborative research and development on knowledge acquisition based on a common distributed system made up of flexible, modular and interconnected technology targeting semantic inference for semi-automatic annotation and retrieval of multimedia content. K-Space Joint Research Activities are:

Content-based multimedia analysis - WP3

Activity WP3.1: Content Structuring
Activity WP3.2: Moving 2D and 3D Object Segmentation and Indexing
Activity WP3.3: Audio/Speech Processing and Text Analysis
Activity WP3.4: Content Description

Knowledge extraction - WP4

Activity WP4.1: Specification of a Multimedia Ontology Infrastructure

Activity WP4.2: Knowledge-assisted Multimedia Analysis

Activity WP4.3: Knowledge-assisted Multimedia Reasoning and Annotation

Activity WP4.4: Reasoning for Knowledge Extraction

Activity WP4.5: Intelligent User Relevance Feedback

Semantic multimedia - WP5

Activity WP5.1: Knowledge Representation for Multimedia

Activity WP5.2: Reference Framework for Distributed Semantic Management of Multimedia Metadata

Activity WP5.3: Semantics-based Interaction with Multimedia

Activity WP5.4: Knowledge Extraction from Complementary Sources

Activity WP5.5: Semantic Descriptions of Multimedia Context

K-Space framework for the integration of software tools - WP6

Activity WP6.1: Distributed Research Environment Design

Activity WP6.2: Research Resource Sharing

Spreading of excellence activities - WP7

Spreading excellence of the results and findings of research of this NoE will target three groups. Academics: the usual instruments known in academic communities will be used. Industry and business players: specific instruments will be used, so that both industrial players and academics can contribute and benefit. Specialist citizen: the aim is address the needs of citizens in the targeted research and developments.

Activity WP7.1: Website and Electronic Newsletter

Activity WP7.2: K-Space Conference - The European Workshop on the Integration of Knowledge, Semantics and Digital Media Technology (EWIMT)

Activity WP7.3: Towards a Scientific Forum in Multimedia Knowledge Extraction and Analysis

Activity WP7.4: Joint Publications

Activity WP7.5: Short courses and Training Programs

Activity WP7.6: Exhibitions and Demonstrations

Activity WP7.7: Contribution to Standards

Activity WP7.8: Technology Transfer

Consortium management activities - WP1

The project management activities are designed to guarantee that the project runs smoothly by ensuring that the objectives are clearly defined and understood. Responsibilities are clearly assigned at activity and sub-activity level, and the consortium agreement will define clear lines of communication among the participants. A transparent and efficient management of both administrative and technical aspects is targeted according to the following activities:

Activity WP1.1: Management Charter

Activity WP1.2: Communication with the EU Commission

Activity WP1.3: Financial Planning

Activity WP1.4: Accounting and Financial Audits

Activity WP1.5: Handling of Legal and Ethical Matters

Activity WP1.6: Concertation, Consensus and Clusters

Activity WP1.7: Overall Coordination of the Joint Activities of the Network

Activity WP1.8: Quality Assurance and Technical Auditing

Activity WP1.9: Gender and Social Issues

Table 2 List of activities for the full duration of project

Activity	QMUL	KU	JRS	ITI	DCU	CWI	GET	INA	EURECOM	GU	DFKI	TUB	EPFL	UEP	Total participants
Integrating activities															
WP2.1 Exchange of Academic Research Personnel	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	**14**
WP2.2 Industrial Placement of Research Personnel	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	**14**
WP2.3 Shared Teaching Resources	✓	✓			✓	✓	✓		✓	✓		✓	✓	✓	**10**
WP2.4 Dissemination to the Non Specialist Citizen	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	**14**
WP2.5 Monitoring and Evaluation of Integration Activities					✓					✓	✓	✓			**4**
Joint research programme															
WP3.1 Content Structuring	✓		✓		✓	✓	✓	✓	✓	✓					**8**
WP3.2 Moving 2D and 3D Object Segmentation and Indexing	✓		✓		✓	✓	✓		✓				✓		**7**
WP3.3 Audio/Speech Processing and Text Analysis							✓				✓	✓			**3**
WP3.4 Content Description	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	**14**
WP4.1 Specification of a Multimedia Ontology Infrastructure		✓		✓		✓					✓				**5**
WP4.2 Knowledge-assisted Multimedia Analysis		✓		✓	✓	✓		✓	✓				✓		**7**
WP4.3 Knowledge-assisted Multimedia Reasoning and Annotation		✓		✓				✓	✓		✓		✓		**5**
WP4.4 Reasoning for Knowledge Extraction	✓		✓		✓	✓	✓		✓	✓					**7**
WP4.5 Intelligent User Relevance Feedback	✓					✓				✓					**3**
WP5.1 Knowledge Representation for Multimedia		✓		✓		✓					✓			✓	**5**
WP5.2 Reference Framework for Distributed Semantic Management of Multimedia Metadata		✓				✓								✓	**3**
WP5.3 Semantics-based Interaction with Multimedia	✓	✓	✓			✓		✓		✓	✓				**7**
WP5.4 Knowledge Extraction from Complementary Sources	✓	✓	✓								✓			✓	**5**
WP5.5 Semantic Descriptions of Multimedia Context		✓	✓	✓		✓					✓			✓	**6**
WP6.1 Distributed Research Environment Design	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	**14**
WP6.2 Research Resource Sharing	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	**14**

Spreading of excellence activities															
WP7.1 Website and Electronic Newsletter	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	**14**
WP7.2 K-Space Conference - The European Workshop on the Integration of Knowledge, Semantics and Digital Media Technology (EWIMT)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	**14**
WP7.3 Towards a Scientific Forum in Multimedia Knowledge Extraction and Analysis	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	**14**
WP7.4 Joint Publications	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	**14**
WP7.5 Short Courses and Training Programs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	**14**
WP7.6 Exhibitions and Demonstrations	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	**14**
WP7.7 Contribution to Standards	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	**14**
WP7.8 Technology Transfer	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	**14**

Consortium management activities															
WP1.1 Management Charter	✓														**1**
WP1.2 Communication With the EU Commission	✓														**1**
WP1.3 Financial Planning	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	**14**
WP1.4 Accounting and Financial Audits	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	**14**
WP1.5 Handling of Legal and Ethical Matters	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	**14**
WP1.6 Concertation, Consensus and Clusters	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	**14**
WP1.7 Overall Coordination of the Joint Activities of the Network	✓														**1**
WP1.8 Quality Assurance and Technical Auditing	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	**14**
WP1.9 Gender and Social Issues	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	**14**

B.4.1 Integrating activities (WP2)

Many of the partners of K-Space either currently collaborate or have collaborated in the past. However, for the most part this corresponds to a loose set of bilateral (or trilateral) collaborations focusing on a specific technological aspect, which whilst demonstrably successful are difficult to sustain and by their very nature have relatively little impact on the European Research Area as a whole. The network of excellence proposed here will build on existing relationships where they exist and will forge new interdisciplinary relationships where previously there have been none. Clearly, initially this will happen between the existing partners within the network. However during its lifetime the network will also reach out to the wider academic and industrial community and initiate new collaborations with partners not currently members of the K-Space NoE. This will ensure impact and benefit beyond the set of currently identified partners. The resulting series of multi-partner network-wide (and beyond) collaborations will provide a suitable platform for real impact in Europe in the field of quality of experience driven tools for knowledge-based multimedia applications.

Integration activities will be carried out as a number of multi-partner tasks within WP2 and WP6. Each activity will have a coordinating partner who will be responsible for ensuring the smooth running of the activity and timely production of deliverables and milestones. One specific activity within this WP will be devoted to periodically gathering evidence of the success (or otherwise) of the network's integration activities. This evidence will be delivered to the Board of Scientific Advisors (described in section B4 and B7), so that it can feed-back recommendations to shape the evolution of the network's activities.

The envisaged integration activities can by divided into two main streams:

- Facilitating mobility of researchers and shared teaching resources, WP2
- Implementation of the K-Space infrastructure for integrative research, WP6

In the following, a detailed description of the different types of integration initiatives envisaged under each WP is given.

WP2 will facilitate the exchange of personnel within the network. It targets researchers at all levels from experienced senior researchers, through post-doctoral level, to PhD level. Specifically, it targets:

- Placement of researchers from academic partners for short stays in the laboratories of other partners within the network.
- Shorter visits of senior academic personnel for information exchange and identification of synergies in order to lay the ground work for new collaborations.
- Placement of personnel from the academic partners with industrial players as interns so that K-Space researchers become familiar with the requirements, methods and practices of industry. Special liaison activities and placements will be sought with the members of the K-Space Industrial Advisory Board. This will ensure an understanding of industry's needs within academia, whilst also facilitating the seamless transition of PhD students into an industrial environment upon graduation.

In order to stimulate and encourage academic collaboration at European level, shared teaching resources and activities will be developed by network participants. In this context, resources means teaching materials (e.g. course notes). An important activity under this initiative will seek to provide a collection of teaching resources for both late stage undergraduate and early stage post-graduate students. The content of these teaching resources will be drawn from other integration activities within the network. In preparing material for the Master's programme, senior researchers will naturally draw on existing teaching resources in their own institutions, as well as adding content on state-of-the-art research topics in order to align the teaching materials with the research focus of the network. Using this material as the starting point will ensure that the resulting web-based collection of teaching resources is not just a "clearing house" for participants' existing lecture notes, but a cohesive repository of valuable documentation on recent advances in the field. In addition the technical presentations in the K-Space colloquium will also be developed for on-line delivery each year. In this way, the collection of teaching resources will have two levels: a relatively stable and fixed set of introductory resources for late stage undergraduates and early stage PhD students and a continuously expanding set of technical contributions illustrating the most recent advances in the field. In either case, developing the material for the web will not simply be a case of putting a set of presentations on-line. Rather, the following features will be developed:

- Links within presentations to related, complementary or illustrative topics within other presentations.
- Online demonstrations to illustrate key concepts and to demonstrate systems and teaching techniques being developed by network participants.

- Indexing of the entire set of materials allowing users search for presentations on specific topics or courses given by network participants.

Activity WP2.1: Exchange of Academic Research Personnel

Coordinating Organization: University of Glasgow (GU)
Coordinator: Prof. Keith Van Rijsbergen
Participants: All members of the network

Description: This activity aims to facilitate the mobility of research personnel with the Network via three sub-activities targeting different kinds of scientific missions. As coordinator, Partner GU will have responsibility for gathering reports submitted by partners after a scientific mission has taken place, i.e. collecting formal reports on the achievements and outputs of each mission and feeding these back to the Network.

Exchange of researchers via short-term fellowships will be organised and will consist of a series of research personnel exchanges whereby one partner will host researchers from another partner for up to 3 months. These short-term research fellowships will be approved by the Network Executive Committee (NEC) based on proposals submitted by partners.

Exchange of PhD students within cooperative research projects will consist of a series of short scientific missions whereby one partner will host one or more PhD students from another institution in order to progress a specific collaborative project. These targeted scientific missions will be approved by the NEC based on proposals submitted by partners.

A series of short visits by the senior researchers working in the Network is envisaged in order to foster new collaborations. Here, established researchers will visit another partner for activities such as a presentation of his/her research, a tour of the host's lab facilities, demonstrations of the host's research results, etc.

Activity WP2.2: Industrial Placement of Research Personnel

Coordinating Organization: University of Economics, Prague (UEP) in liaison with the Industrial Advisory Board
Coordinator: Dr. Vojtěch Svátek
Participants: All members of the network

Description: In this activity, industrial players will be approached to host Network researchers. Special liaison activities and placements will be sought with the members of the K-Space ***Industrial Advisory Board***. As coordinator partner UEP will have responsibility for gathering reports submitted by partners after an internship has taken place, i.e., collecting formal reports on the achievements and outputs of each internship and feeding these back to the NoE.

PhD and postdoctoral level researchers will be hosted by industrial players for short periods of time. During this period, the researchers will act as short-term employees participating in the day-to-day business of the industrial participant in this NoE schema. It is expected that the members of the K-Space Industrial Advisory Board plays an important role in helping to realise this activity. (WP2.2.1)

In the period immediately following the submission of a thesis by a PhD student within the Network, the student will have the opportunity to take up a short-term industrial placement. The placement acts a "finishing school" for PhD students, giving them breathing space in a relevant training environment prior to the next stage of their career. (WP2.2.2)

Activity WP2.3: Shared Teaching Resources

Coordinating Organization: Technische Universität Berlin (TUB)

Coordinator: Prof. Thomas Sikora

Participants: QMUL, KU, DCU, CWI, GET, EURECOM, GU, DFKI, EPFL, UEP

Description: This activity will leverage existing teaching resources of the academic partners as well as new resources prepared for the K-Space annual Summer school. It will develop the tutorial material prepared for the annual Summer school and the technical presentations made as part of the workshop for web-based access. This will involve producing an indexed and searchable version of the material presented, adding any web-based demos available and structuring the content to provide links between specific resources.

Activity WP2.4: Dissemination to the non specialist citizen

Coordinating Organization: Joanneum Research Forschungsgesellschaft mbH (JRS)

Coordinator: Werner Haas

Participants: All Network members

Description: An important dissemination goal is to allow the non specialist citizen access to the outputs of the technology that is being developed. The objective of this Activity is to establish at an early stage main interest of end users. This will provide feedback on the technical developments of the NoE and contribute to the success of the research, hence to the sustainability of the NoE. This particular dissemination objective will be linked to the development of focused scenarios aimed at testing the technical implementations in real-world applications and serve as proof of concept for the K-Space model.

Activity WP2.5: Monitoring and Evaluation of Integration Activities

Coordinating Organization: Dublin City University (DCU)

Coordinator: Dr. Noel O'Connor

Participants: All WP2 activity leaders

Description: This activity has responsibility for evaluating integration activities on an ongoing basis. It will gather evidence of the success (or otherwise) of integration activities and feeding this back to the network Scientific Advisory Board for evaluation.

B.4.2 Programme for jointly executed research activities: JRA (WP3, WP4, WP5 and WP6)

At technical level K-Space will focus on collaborative research and development on knowledge acquisition based on a common distributed system made up of flexible, modular and interconnected technology targeting semantic inference for semi-automatic annotation and retrieval of multimedia content. The main objective is to close the gap between the low-level content descriptions that can be computed automatically by a machine and the richness and subjectivity of semantics in high-level human interpretations of audiovisual media. Cleary, the challenges involved require a wide range of technical expertise and specialities. The JRA targets on the one hand semantic-based multimedia analysis and on the other hand low-level multimedia analysis as well as the use of these technologies for knowledge extraction to bridge the semantic gap and enable content annotation using semantic concepts derived from high-level human interpretations of audiovisual media

In order to cover key technology needed to achieve semantic inference for semi-automatic annotation and retrieval of multimedia content a broad range of expertise is required. This is due to the interdisciplinary nature of semantic and knowledge based media processing which draws on signal-processing, semantic web, linguistics, data mining, etc. Clearly, a network targeting all R&D aspects of knowledge-based media processing could become unfocused and self-serving. Consequently, K-Space is focusing on four key aspects which are clustered in the following three WPs.

Content-based multimedia analysis –WP3: Targeting the development and implementation of content-based multimedia analysis tools and methodologies for low and medium-level signal processing, natural language and speech processing, multimodal techniques, high dimensionality reduction, low-level feature fusion.

Knowledge extraction –WP4: Focusing on the development of advanced techniques for semantic based multimedia analysis with low-level content-based multimedia processing in order to bridge the semantic gap and enabling content annotation using semantic concepts derived from high-level human interpretations of audiovisual media.

Semantic multimedia –WP5: Aiming at the development and implementation of advanced techniques that will be needed for semantic-based multimedia analysis including: adaptation of existing languages, representation of extracted semantic information, multi-media context and reasoning and their integration with Semantic Web technologies to enable automatic content sharing, processing and interpretation by machines.

The networking and distributed interaction between modules and clusters will be supported by state-of-the-art database management tools, networking protocols and interfaces. The integration of these tools to build the K-Space communication infrastructure will be conducted within another workpackage: ***K-Space Framework for Software Tools Integration –WP6***.

B.4.2.1 Content-based multimedia analysis – WP3

WP3 conducts research into tools and methodologies for low- and medium-level multimedia content analysis. This targets the K-Space in a bottom-up way, i.e. adapting low-level techniques for knowledge-based multimedia analysis. It includes: multimodal techniques (including text, images, video and audio information), low and medium level signal processing, speech processing, text analysis, cross-modal interaction, high dimensionality reduction, low-level feature fusion and data mining. For the results of these analysis algorithms suitable descriptors or description schemes for MPEG-7 or other appropriate description standards will be developed. These description schemes will be contributed to the appropriate standardisation bodies within WP7.7 “Contribution to standards”.

The activities in this workpackage target topics like content structuring, moving object segmentation, event detection, audio processing, text analysis and data mining. By researching these topics all the techniques stated above will be covered and combined in a manner yielding the optimum result. Content description is a transversal topic across all the other activities in this WP, and in close relation to other workpackages extracting content descriptions, proposing on the one hand extended and new descriptors and description schemes and on the other hand profiles suitable for media processing and inference of higher level descriptions.

The information provided by this WP will be used in WP4 and WP5 to gain higher-level information from the extracted low- to mid-level information. The modules or applications will follow the interfaces defined in WP6 enabling easy access by applications from other WPs.

Activity WP3.1 Content Structuring

Coordinating Organization:	Joanneum Research Forschungsgesellschaft mbH (JRS)
Coordinator:	Werner Haas
Participants:	QMUL, DCU, CWI, GET, INA, EURECOM, GU

Description: The structure of a content item (film, video) is one of the most interesting pieces of information for humans. Certain types of content have a defined structure (e.g. news structured in moderation, contributions, interviews, or movies at a very high level structured in introduction of actors, unfolding of story, grand finale), revealing this structure helps in inferring semantic information, and is an important prerequisite for summarization and browsing. Despite the different structure in different types of content, there is a set of commonly applied rules to express content coherence, which are generally understood by a human audience. The ultimate goal would be to decode this “grammar of moving images”, thereby giving the user a high level structural overview on the content.

In order to be able to decode this structure and infer semantic content coherence, more low-level information is used. This encompasses shot and transition information in the audio and visual domain (here also the detection of graphical/effect transitions/wipes are important), scene segmentation (by using features like speaker(s) continuity, camera movement detection, shot similarity (again in the audio and visual domain)), detection of concepts such as events, detection of setting or classification of shot setting (indoor, city …) and scene type (dialogue, action, montage, etc). In most of the cases multimodal techniques have to be used to infer the content structure. This activity will focus on the reliable extraction of the lower level information and using this as the basis for techniques for content structuring.

This activity focuses on extracting the structure of one audiovisual content item. The features that are extracted for this purpose are also highly relevant for data mining (WP5.4), especially for supporting browsing and exploration of multimedia collections.

Activity WP3.2 Moving 2D and 3D Object Segmentation and Indexing

Coordinating Organization:	Dublin City University (DCU)
Coordinator:	Dr. Noel O’Connor
Participants:	QMUL, JRS, CWI, GET, EURECOM, EPFL

Description: Information on the objects present in a scene is fundamental for high level knowledge extraction, object recognition and classification. Based on the extraction of individual moving objects and their categorization and description the interaction between objects can be described. This task will deal with segmentation and indexing of objects extracted from video sequences and annotation of 3D objects.

Approaches to moving object segmentation will be investigated (WP3.2.1). The extracted objects will be described in a manner suitable for higher level knowledge extraction, which includes both the low-level features (colour, texture, shape) of the regions constituting the object and a structural description of the object (relation of the object’s regions) and the interrelationship of the individual regions over time. Another

result is the number of objects in a scene, and a description of the object's trajectories over time. This information can be used to infer understanding of the actions in a scene, especially if object identification is available. Automatic moving object segmentation provides a large number of object descriptions in an efficient way. Object classification can be applied on this huge set of extracted and feature described objects. This enables computer supported semi-automatic object recognition solutions.

The availability of 3D models is a relatively recent phenomenon and research in 3D retrieval is an emerging area. This is evidenced by the few relevant publications in the area. Related techniques use clues such as shape distribution, histogram, skeleton, principal curvatures, 3D Hough transform, 3D Fourier transform and spherical harmonics. None of these techniques is mature enough yet to provide a satisfactory solution for the conflicting requirements of accuracy, efficiency and flexibility and statistical richness. This activity (WP3.2.2) addresses these issues with specific focus on:

- Comparative assessment of available 3D indexing techniques
- Study of signal processing, computer vision and potential metrics to compare signatures of 3D models.
- Development of a pose-invariant geometry and texture-based feature set and a matching metric that optimises accuracy, efficiency and flexibility to allow small differences between 3D models.
- Evaluation of the proposed system on 3D models repositories.

Activity WP3.3 Audio/Speech Processing and Text Analysis

Coordinating Organization: Groupe des Ecoles des Télécommunications (GET)

Coordinator: Dr. Gaël Richard

Participants: DFKI, TUB

Description: The aim is to advance the current state-of-the-art in audio semantic analysis and feature extraction. Furthermore, it appears essential to develop low-level, ontology-aided techniques and cognitive processing engines able to integrate knowledge and intelligence even in low-level analysis. Extension of state-of-the-art processing and analysis algorithms to handle high-level, conceptual representations of knowledge embedded in audiovisual and textual content based on reference ontologies and intelligence techniques will be explored.

The activity WP3.3.1 will consider all types of audio sources ranging from speech to complex polyphonic music signals. The recently standardized MPEG-7 defines how audio signals can be described at different abstraction levels: from the lowest level (primitives - such as for example: temporal or audio spectrum centroids, spectrum flatness, spectrum spread, inharmonicity, etc.) to the highest level (related to semantic information). In this context, semantic information is related to textual information on audio such as titles of songs, singers' names, composers' names, duration of music excerpt, etc. It can be claimed that the defined primitives might not be sufficient to describe a musical item properly. To be remembered is the fact that music can be described in a number of ways and the musical sounds include polyphonic sounds and human voice sounds (speech and singing). A musical signal, music, scores (graphical form), MIDI code or verbal description each comes as a different representation. It seems there exists a way to change primitives into higher abstraction level, namely semantics. This activity will also study methods for the classification and time-frequency segmentation of audio signals. Time-frequency segmentation according to sound sources will be addressed. An interesting aspect of this segmentation will include speech emotional analysis which permits to gather important semantic information such as automatic detection of fear/panic for multimedia surveillance applications, or automatic detection of happy vs. sad scenes in movies, detection of abnormal dialogue situations in call centres. Different acoustic features and their discrimination abilities will be studied. Both time and frequency domain feature extraction will be considered. Linear data-driven feature transformations which transform the original feature stream into a base with lower dimensionality and better statistical properties will be investigated. Particular attention will be devoted to the evaluation of various acoustic modelling strategies and statistical inference methodologies. These will include e.g. hidden Markov models, dynamic Bayesian networks, neural networks, and support vector machines, for each of these, various learning strategies will be considered. A question of primary interest will be a study of the unsupervised segmentation ability of dynamic models. These various methodologies will be evaluated on tasks such as: speaker segmentation, audio indexing and large vocabulary models for speech recognition.

This activity WP3.3.2 is very similar to WP3.3.1, with the difference that it will apply to associated texts, being text included in the image and which has to be extracted from it and transformed to "real text" using OCR. But the activity will also be concerned by available textual metadata on an image/video or with texts surrounding an image (like caption or typical expressions referring to the content of an image, lie "This picture depicts a…". Textual analaysis can also be applied to a certain extent to the transcripts resulting from

the speech recognition procesudre described in WP3.3.1. However we count here with limitations due to the actual poor accuracy of the general purpose speech recognition. In fact WP3.3.2 is very closely related with WP5.4 (Knowledge Extraction from Complementary Sources), and in WP3 the focus will be on integrating the content extracted in WP5.4 in the framework of a multimodal content structuring for multimedia, which is the topic of WP3.

Activity WP3.4 Content Description

Coordinating Organization:	Joanneum Research Forschungsgesellschaft mbH (JRS)
Coordinator:	Werner Haas
Participants:	All members of the network

Description: This activity is horizontal to the other activities of this WP. It aims at developing the tools and means to describe the metadata extracted by the content analysis tools of this WP. Based on existing standards for multimedia content descriptions (MPEG-7), description schemes and descriptors will be extended or new descriptors will be defined. In cooperation with WP 7.7., these extensions will be contributed to the appropriate standardisation bodies. In addition to this, metadata profiles will be developed appropriate to hold all the information needed for efficient content based indexing, search and retrieval. The profiles are tailored towards their respective application domain, so that they avoid unnecessary generality and thus foster interoperability and reduce the complexity of applications working with the descriptions.

As a structuring activity, infrastructure for automatic content analysis will be developed. Furthermore both local and distributed infrastructure for creation and manipulation of MPEG-7 documents, including reference implementation for the newly defined descriptors and description schemes, will be provided. The content analysis and MPEG-7 infrastructure will be based on components currently developed at JRS and provided together with WP3 to all relevant WPs.

B.4.2.2 Knowledge extraction – WP4

Content-based analysis of multimedia requires methods which will automatically segment video sequences and key frames into image areas corresponding to salient objects (e.g. cars, road, people, field, etc), track these objects in time, and provide a flexible framework for object recognition, indexing, retrieval and for further analysis of their relative motion and interactions. This problem can be viewed as relating symbolic terms to visual information by utilizing syntactic and semantic structure in a manner related to approaches in speech and language processing. More specifically, low-level multimedia features (e.g. MPEG-7 descriptors) are assigned to semantic concepts and visual processing algorithms are assigned to object attributes thus forming an a-priori knowledge base. Processing may then be performed by relating high-level symbolic representations to extracted features in the signal (image and temporal feature) domain. Basing such a representation on an ontology, one can capture both concrete and abstract relationships between salient visual properties.

WP4 aims at exploiting the development and results of WP3 and WP5 to provide techniques for the semantic analysis, annotation and retrieval of multimedia content. The overall approach will be based on knowledge assisted content analysis and annotation using a multimedia ontology infrastructure. More specifically, semantic and low-level attributes of the objects to be detected in combination with appropriately defined rules developed within WP5 will determine the set of algorithms, which will be the aim of WP4, and parameters required for the detection of semantic objects. Semantic concepts within the context of specific domains will be defined in ontologies, extended with qualitative attributes of the semantic objects (e.g. colour homogeneity), multimedia processing methods (e.g colour clustering), and numerical data or low-level features (e.g. colour models, also defined in the ontology). Semantic Web technologies will be used for knowledge representation including rules to describe how tools for multimedia analysis should be applied according to different object attributes and low-level features as was explained in WP3. Rules describing spatiotemporal relations of objects will be also defined.

Semantic object detection considers the exploitation of object characteristic features in order to apply the most appropriate detection steps for the analysis process in the form of algorithms and numerical data generated by the content-processing algorithms of WP3. Additionally, spatial relations among the desired objects will further assist the analysis of multimedia content. Following this approach, the multimedia analysis process depends largely on the knowledge base of the system and as a result the method can be easily applied to different domains provided that the knowledge base is enriched with the respective domain ontology. Enriching the knowledge base with spatial and temporal object interrelations would be an

important step towards the detection of semantically important events for a particular domain, e.g. a car veering off the road or a player scoring a goal.

Activity WP4.1 Specification of a Multimedia Ontology Infrastructure

Coordinating Organization: Koblenz University (KU)

Coordinator: Prof. Steffen Staab

Participants: ITI, CWI, DFKI, UEP

Description: Development of a multimedia ontology infrastructure based on the knowledge representation infrastructure and language extensions developed within WP5. This will contain qualitative attributes of the semantic objects (e.g. colour homogeneity), multimedia processing methods (e.g colour clustering), and numerical data or low-level features (e.g. colour models). Furthermore, to facilitate full scale annotation of multimedia documents, the ontology infrastructure will also contain the representation of the top-level structure of multimedia documents. More specifically, the ontology infrastructure is organized as described in the following paragraphs.

Firstly, the research on top-level multimedia content ontology will develop representation of the structure of the content of multimedia documents (WP4.1.1). The top level hierarchy of a multimedia document is classified into types like Image, Video, Audio, Audiovisual and Multimedia. Each of these types has its own segment subclasses, which are also represented in the ontology. It also models the structure of multimedia content in time and space using multimedia spatiotemporal decompositions and relations described in the MPEG-7 Multimedia Description Scheme (MDS). Building on top of existing MPEG-7 MDS ontology modelling approaches, links to low-level multimedia information, high-level creation, media and usage information, as well as domain knowledge, will enable full scale semi-automatic annotation of multimedia content.

Secondly, the research on low-level visual feature ontology will concentrate on modelling of the concepts and properties that describe visual features of objects, especially the visualizations of still images and videos in terms of low-level features and media structure descriptions (WP4.1.2). Its structure and semantics will be largely consistent with the MPEG-7 multimedia description standard and several modifications will carried out to adapt the XML Schema provided by MPEG-7 to an ontology. The entire ontology will follow closely the specification of the MPEG-7 Visual part, with the appropriate adaptation of the complex data type representations. Sub-concepts will include standard MPEG-7 features like colour, shape, texture, motion, localization and basic descriptors. Additional features that are not part of the MPEG-7 Visual will also be modelled and included in the visual feature ontology, following a requirements collection process for low-level processing algorithms of WP3. The targeted study will follow a layered approach building on existing standards.

Lastly, designing the prototype knowledge base will enable automatic object recognition in images and video sequences (WP4.1.3). Prototype instances will be assigned to classes and properties of the domain specific ontologies, containing low level features required for object identification. The instances will be stored in the prototype knowledge base using a multimedia ontology population and management tool developed for this purpose. In a semi-automatic way, this tool will first extract the visual objects features and then store them as instances of domain concepts in the knowledge base. Extending existing work on visual descriptor extraction, the tool will enable a full range of functionalities to acquire, organize, process and manage multimedia information and will be used to construct the required knowledge base using the domain ontologies built in WP4. Prototype visual features will be matched to the extracted visual features during knowledge assisted multimedia analysis in order to produce a ranked set of hypotheses and to assist the reasoning process.

Activity WP4.2 Knowledge-assisted Multimedia Analysis

Coordinating Organization: Informatics and Telematics Institute (ITI)

Coordinator: Dr. Yannis Avrithis

Participants: KU, JRS, DCU, CWI, INA, EURECOM, EPFL

Description: This activity addresses semantic object detection exploiting the ontologies of WP4.1 and the content processing algorithms of WP3 in order to apply the most appropriate detection steps for the analysis process. Knowledge assisted multimedia analysis is divided in two levels. In the first level, numerical algorithms are used to exploit symbolic a-priori knowledge to extract objects that may have symbolic meaning. In the second level, ontological knowledge will be employed to infer high-level concepts and

events through which context can be acquired. Both are carried out in an interactive fashion. This is a central activity of WP4, as the multimedia ontology infrastructure of WP4.1 is employed to analyze content, assisted also by the reasoning and context analysis techniques of WP4.3 and WP4.4, respectively.

An automatic way for transition from low-level features to symbolic entities will be employed (WP4.2.1). Segmentation algorithms available from WP5 and based on low-level features such as colour, texture, edges and motion, will partition images in segments that may have symbolic interpretation. State of the art algorithms based on region homogeneity, boundary and saliency criteria will be examined in a unified way in this activity, while fusion techniques will be employed to combine and merge different partitions. Using different scales and termination criteria, the segmentation granularity will be controlled, and a partition hierarchy will be constructed, to be refined using knowledge, also enabling fuzzy partition labelling and supporting efficient uncertainty handling. Machine learning techniques such as neurofuzzy networks or support vector machines will be trained to match the regions to instances of the prototype knowledge base and detect an initial list of possible region labels.

After merging, partition hierarchy construction and initial labelling, not only objects may be identified, but semantic events as well, while scenes may be categorized in predefined classes (e.g. indoors/outdoors/landscape/city etc.) (WP4.2.2). To facilitate this and shift the analysis process to the semantic level, ontological knowledge about the domain of interest will be employed. The ontologies will contain domain knowledge structured in a way to assist the recognition and final labelling process. Partonomic relations of composite objects (e.g., table, chair, house) along with general purpose relations, rules and spatiotemporal coherence constraints will provide the means to accomplish this subtask. In the reasoning activity, such knowledge facilitates consistency checking and the extraction of implicit knowledge. Tracking techniques will be applied to identify and track independent motion of labelled objects in video scenes, especially in cases of articulated motion, occlusion, and multiple disconnected regions with similar motion requiring perceptual grouping.

Activity WP4.3 Knowledge-assisted Multimedia Reasoning and Annotation

Coordinating Organization:	Informatics and Telematics Institute (ITI)
Coordinator:	Prof. Michael Strintzis and Dr. Yiannis Kompatsiaris
Participants:	KU, DFKI, INA, EURECOM, DFKI, EPFL

Description: This activity targets extraction of meaningful interpretation of high level events and automatic semantic annotation of multimedia content, in collaboration with numerical and symbolic analysis of WP4.2. Although at knowledge assisted multimedia analysis stage of WP4.2 the produced segments bear semantic information, further analysis and consistency checking is required to provide for the robust, accurate detection and representation of meaningful concepts in compliance with human perception. This is not simply a post-processing step; knowledge-assisted analysis and reasoning are rather two coupled mechanisms. Three types of reasoning activities are required for this purpose, as described below.

Exploiting the spatiotemporal information of the processed audiovisual segments plays a significant role in the identification, tracking, annotation and retrieval of objects and events from multimedia content, since part of the underlying semantics is implicitly embodied in the spatiotemporal relations of the multimedia data (WP4.3.1). Spatiotemporal relations can be interpreted as constraints between variables representing the defined domain concepts, thus forming a problem to be solved using a constraint reasoning system. Constrained reasoners are systems designed to prove whether or not a given set of constraints is satisfiable on a specific set of variables and to provide the possible solutions if such exist. A multimedia constraint reasoner will be developed to process the set of initial region labels produced in WP4.2.1 and generate a reduced number of regions along with a reduced set of hypotheses for each one, thus assisting in the task of semantic analysis in WP4.2.2.

In order for the reasoning system to be able to handle the two considered tasks, i.e. region merging and evaluation of the plausibility of the initial hypotheses, appropriate rules need to be defined (WP4.3.2). Considering the first task, the defined rules could exploit topological information. For example, a set of segments initially labelled as belonging to the same object class should be merged to form a single object instance, if related to one another through adjacency or inclusion. In a similar way, partonomic and spatiotemporal information can be exploited to reduce the hypotheses of a region, depending on its neighbouring segment labels and spatial interrelations. Consequently, the second task deals with the expectation of typical locations of the sought objects – either absolute within a scene or in relation to each other. The integration of low-level features in the reasoning process will further improve the plausibility of the detection results.

Along with the constraint and the rule-based reasoning, general purpose reasoning will enable full scale semi-automatic annotation of the multimedia content (WP4.3.3). For this purpose, a reasoner is essential to check the consistency and the validity of the produced instances, extract implicit knowledge using subsumption and equivalence relations defined in the ontologies and, finally, transform semantic knowledge into numerical data, if necessary, to be used in the analysis process. Different approaches exist for constructing general purpose reasoners according to the logic formalism that is used for constructing the ontologies. Description logics have proved suitable for multimedia applications since they have large expressive power and preserve considerably low computational complexity. However, the inherent uncertainty of multimedia information, involved in tasks like query, retrieval, or recognition, imposes the need to extend current logic formalisms to represent fuzzy concepts (e.g., high mountain, or fat person) and adapt existing reasoners to handle such knowledge and produce ranked query responses. While all annotation is automatically generated in this subtask, manual annotation through user interaction is handled in WP5.3.3.

Activity WP4.4 Reasoning for Knowledge Extraction

Coordinating Organization: University of Glasgow (GU)

Coordinator: Dr. Joemon Jose

Participants: QMUL, JRS, DCU, CWI, GET, EURECOM

Description: The idea of extracting knowledge in large data sets demands novel techniques for making sense out of multiple representations. For example, in order to detect events in video one may need to use multimodal techniques combining audio and visual information. Combining the similarities of different descriptors (either from the same or different modes) is in most cases not straightforward. Recent research has made some inroads into this process by proposing theoretical approaches, representation and inference techniques. The research under K-Space investigates a number of approaches to multimedia processing and knowledge extraction. In this activity we will investigate the development of effective and efficient techniques for data mining. Such approaches will cater not just knowledge extraction but also information retrieval in context.

These tools should help the users in finding the nuggets and knowledge that are hidden in these masses of distributed data they potentially have access to. The traditional list of documents displayed to the user upon the receipt of her/his query is no longer satisfactory. The answer to an information need cannot simply be found in a document, as a variety of resources are relevant in a given context to extract or to create the relevant pieces of information. In addition to efficient information retrieval engines that give direct access to the documents that are stored, users need some tools that provide them with global views of the available information, help them to discover information in huge mass of documents and derive new information or knowledge from target sub-collections of documents. Visualisation of the information with spatial distances between pieces of information can be a useful tool to filter, mine, disambiguate and make contextual large amounts of information. These aspects are related to content mining, i.e. studying the message carried by or hidden in the document contents from a given domain, taking into account various type of information linkage and user's interactions. By giving the user a suite of flexible tools to represent, manipulate and analyse information, the user can form and test hypotheses, which could lead to a better retrieval experience. A special area to tackle here is the structuring and browsing of raw material (so called rushes), this often contains very similar and lengthy shots. Providing tools to be able to get a quick overview on the set of rushes and depict the items/sections most relevant to the current production is an essential aid to the production team.

A complementary mining task is usage mining that is based on analysing the user's behaviour (logins, browsing, queries, domains of interest). This latter aspect will also be tackled in this activity. We will also consider information linkage, which represents the behaviour (usage) of the information creators, multimedia media and cross information mining. One important component of this type of mining is the dynamics of the data. That is how the data changes in time and hence changes the context.

Activity WP4.5 Intelligent User Relevance Feedback

Coordinating Organization: Queen Mary, University of London (QMUL)

Coordinator: Dr. John Bigham

Participants: CWI, GU

Description: The main objective of this activity is to exploit human-machine interaction as complex interplay between user, the audio-visual content, and their semantic interpretations. The goal is to derive semantic information from past experience using relevance feed-back. Initial work will focus on binary classification

problems using support vector machines. Given a piece of multimedia content, the user will input information on its relevance with respect to a predefined semantic concept. The machine will learn from this input and infer corresponding classes of content in further classification iteration. Other kernel based methods will be investigated and intermediate results will be use to reinforce automatic annotation extracted in other activities.

B.4.2.3 Semantic multimedia – WP5

It is the purpose of this workpackage to use and extend semantic web technology in order to reflect the needs of multimedia analysis and knowledge extraction and, thus, to facilitate the bridging of the semantic gap. This purpose will be pursued along a number of dimensions to which belong the following:

Knowledge representation will be extended in a way as to facilitate representation and reasoning with facts about multimedia sources. In particular, there is a need to have a common ontological basis for multimedia metadata such that agreement between different providers and various consumers is reached more easily. Also knowledge representation must allow for distinguishing factoids such as "this picture has a size of 5 MB" from quotations like "this picture shows how Schumacher wins the pole position" vs. "this picture shows how Schuhmacher loses the pole to Baricello". Current standards mostly ignore this problem, e.g., like OWL, or they solve it in such a way that it may not be easily integrated with the different needs of the semantic web, like ontologies, rules, proof and trust, which is what RDF does. Thus, K-Space will here provide input to standardisation at the language level as well as at the multimedia ontology top-level. It will also align with existing/ongoing description standards such as MPEG-7 and MPEG-21.

In order to become a successful input to standardization activities and contribute to the overall impact of K-Space, we will also integrate the new knowledge representation paradigm into a new semantic management infrastructure. Thereby, we will define a reference framework of APIs and modules such that other European proponents from outside of K-Space may contribute or make use of the infrastructure.

Even an advanced infrastructure and a sophisticated multimedia analysis will not be sufficient to really close the semantic gap. The reason is that a lot of knowledge around the use and the context of multimedia sources is needed in order to bridge between low level multimedia features and the pragmatics of its use. To this end, WP5 foresees a triple strategy:

- Investigate how people interact with multimedia in order to derive new semantic characterizations, which may be exploited in the life cycle of the multimedia data.
- Extract knowledge from complementary sources (such as subtitles of movies or web sites of similar multimedia data) in order to derive additional semantic characterizations.
- Provide a mechanism to handle such additional context-based characterizations, i.e. constructing, representing, querying and using them.

Hence, WP5 considers the needs from the preceding workpackages in order to represent semantic metadata as well as experience and needs of its users. In order to demonstrate its capabilities and maximize its impact, WP5 provides languages, ontologies and a reference implementation framework. Although this workplan constitutes a very ambitious task, it appears to be feasible because of previous preliminary work by the leaders of the corresponding subtasks. The semantic web group has been chosen in order to achieve this unique mixture of competencies such that in the network they may pursue such ambitious objectives and also reach their goals.

Activity WP5.1 Knowledge Representation for Multimedia

Coordinating Organization: Koblenz University (KU)

Coordinator: Prof. Steffen Staab

Participants: ITI, CWI, DFKI, UEP

Description: In this activity the knowledge representation problems of semantic multimedia are approached.

Existing standards for knowledge representation do not appropriately allow distinguishing facts about a picture, such as a picture being 5MB, from topics of a picture, such as a picture being about a tsunami, and from quotations of an event or state that a picture shows, e.g. a picture depicting Schuhmacher winning pole position. While RDF provides very simple primitives (reification) to do this in principle, these primitives are not easily usable, they are not powerful enough and they do not easily scale up to more powerful ontology languages – thus languages like OIL or OWL always have ignored them leading to the unfortunate situation that it is hardly possible to describe a complex event appearing in some multimedia. It is the purpose of this

subtask WP5.1.1 to provide a more general mechanism for describing quotations. As a starting basis we will be able to exploit the Triple language, which provides a simple means to distinguish different contexts. The Triple language needs to be investigated and aligned with proposals like OWL or SWRL. The result of this subtask (WP5.1.1) will be input for ongoing revisions and/or branches of semantic web languages.

Eventually semantic metadata should be exploited in a most fruitful way using the expressive capabilities of the knowledge representation language and the ontologies. To this end we will investigate semantic reasoning mechanisms in the second subtask (WP5.1.2), such as semantic similarity reasoning, spatiotemporal reasoning and access of quotations about multimedia data. Thus, task 5.1 provides the comprehensive means to represent semantic multimedia and reason with it.

Activity WP5.2 Reference Framework for Distributed Semantic Management of Multimedia Metadata

Coordinating Organization: Koblenz University (KU)

Coordinator: Prof. Steffen Staab

Participants: UEP, CWI

Description: In order to achieve technological progress as well as high impact, the K-Space consortium aims beyond contributions to standards and towards a reference framework for implementation[2], which may help the European consortium to take-up and exploit results. The reference framework will use the knowledge representation means achieved in task 5.1 and provide a corresponding definition of requirements and application programming interfaces. In particular, these interfaces reflect end users needs for distributed semantic management of multimedia metadata. As building blocks for this framework we foresee components that are described in the following paragraphs.

First component is concerned with efficient storage and querying facilities for semantic metadata at a single station. (WP5.2.1)

Quite naturally, user-owned multimedia will not be stored in a centralized repository, but rather it will be available in a networked system of peers. The user will then semantically query this system to find semantic descriptions of multimedia that fit his needs. Such querying must find the right sources (mostly) without direct interference by the user. The reader may note that this part of work is not concerned about digital rights management, because all that is shared is supposed to be the metadata and whether a download is offered or not depends on the underlying file sharing system for which only an API is provided. (WP5.2.2)

In order to offer ways of structuring one's own sources of multimedia (metadata), the reference framework will allow the user to provide their own structuring into folders and semantic categories. A corresponding framework will be defined in this component. (WP5.2.3)

While the individual organization of multimedia files and structure is of major importance for retrieving one's own files, the amount of such individual semantic classification is very limited. K-Space will narrow the gap between low level features and high-level semantic descriptions by exploiting the sum of user contributions. For this purpose, a framework to share semantic structures with the purpose of enhancing overall semantic retrieval capabilities will be defined. (WP5.2.4)

Activity WP5.3 Semantics-based Interaction with Multimedia

Coordinating Organization: Centrum voor Wiskunde en Informatica (CWI)

Coordinator: Prof. Lynda Hardman

Participants: QMUL, KU, JRS, DCU, INA, GU, DFKI

Description: The task 5.3 plays a dual role. First, on top of the infrastructure of Task 5.2, we need capable user interfaces that make the maximum out of the available metadata in order to enhance semantic retrieval (including keyword queries, browsing and re-categorization) through a presentation tailored to the user.

Second, there remains the need to augment the basis of semantic metadata through: manual annotation; semi-automatic annotation; and implicit annotation (emergent semantics).

Activity WP5.4 Knowledge Extraction from Complementary Sources

Coordinating Organization: German Research Centre for Artificial Intelligence (DFKI)

Coordinator: Thierry Declerck

[2] Highly successful reference frameworks on which successful industries build include, e.g., J2EE, with the open source implementation JBoss.

Participants: QMUL, KU, JRS, UEP

Description: The sophistication as well as the subjectivity that users demonstrate with handling multimedia (and, in fact, other) content is derived from their simultaneous exploitation of all modes of interaction and from their wide experience with similar resources. While we cannot fully reproduce this human success in interpreting multimedia material in context, we may progress a long way by simulating the semantic interaction with some background material, like caption and surrounding texts, audio comments etc. This background material is proposing de facto semantic descriptions of the multimedia content that are not formulated at the same level as the typical low-level features. As such natural language is much closer to the kind of semantics that is deployed in the Semantic Web initiative. Thus associations of semantically annotated background/complementary material with multimedia content annotated with low-level features can contribute to offer training data that can help supporting an improved (semi-) automatic semantic annotation of multimedia content and in doing so reducing the semantic gap in multimedia content.

This activity will address mining within two different types of resources:

- Mining Primary Resources: Analysis of the primary resources that are attached to the multimedia data, e.g. texts around pictures, subtitles of movies, etc.
- Mining Secondary and Tertiary Resources: Analysis of data and text related to the multimedia data under consideration, e.g. a programme guide for a TV broadcaster or a web site displaying similar pictures.

Activity WP5.5 Semantic Descriptions of Multimedia Context

Coordinating Organization: University of Economics, Prague (UEP)

Coordinator: Dr. Vojtěch Svatek

Participants: KU, JRS, ITI, CWI, DFKI

Description: In the representation paradigm employed in the description until now, we have considered multimedia metadata as being objective, unbiased and neutral with regard to topics. However, in reality the meaning of multimedia data depends a lot on the context in which it appears, in which it is queried and from whom it is queried. Task 5.5 is a foundational research activity on investigating the challenges of multimedia context and proposing solutions for earlier subtasks. This activity will enable iteration possibilities over previous activities. It will also aid significantly in the process of reasoning on spatial relationships, as context models and analysis algorithms are used within the framework of multimedia reasoning, while neatly linking the work of WP3 and WP4. Specific research topics tackled in this activity include:

- Representation of Multimedia Metadata augmented by context information
- Sharing of organizational structures based on user context (such as age, group memberships, friendships, etc.)
- Context-enhanced Semantic Retrieval
- Context-enhanced Semantic Annotation
- Context-enhanced Knowledge Extraction

Specifically, visual context in knowledge extraction from multimedia content refers, for instance, to lighting conditions (day/night), weather (sunshine/rain/fog), and other parameters like location, camera position, specific scene domain/category, scene distance and so on. The goal is to build relationship models that define the co-existence, spatial arrangement, distribution of objects of interest in a scene, so that detected objects are used to infer context and vice versa (e.g., a car is more likely to appear in a street than inside a room). Automatic detection of salient or interesting regions in an image will guide the knowledge-assisted analysis process in WP4.2.2, through a selective visual attention mechanism inspired by the human optical system.

B.4.2.4 K-Space Framework for the Integration of Software Tools –WP6

The integration activities outlined in WP2 are the natural by-products of a network that supports concerted collaborative activities between large numbers of researchers. The goal of WP2 is to plan, stimulate, guide and disseminate these activities ensuring the lasting impact and sustainability of K-Space. The objective of WP6, on the other hand, is to design and instantiate the technical infrastructure required to enable and facilitate these integration activities to take place. It will ensure that the necessary support is in place in order to allow partners to collaborate effectively. Addressing this on a project-wide basis seeks to reinforce the Network objective of growing existing collaborations from bi-/tri-lateral activities between partners to wider collaborative projects involving multiple partners from both the Semantic Web and Multimedia Content

Analysis communities. To achieve this objective it is necessary to facilitate research resource sharing between partners so that tools, interfaces, test data and results can be exchanged in a straightforward manner by multiple partners. Whilst the project will not design and develop an integrated platform/demonstrator for all technology developed by all partners, it will put in place the necessary software and network interfaces required to ensure that every partner has access to the research resources of other partners. It is not the focus of this WP to perform research into the technology required to do this, or even to extend existing technologies. Rather, existing state-of-the-art network protocols and software APIs will be adopted and used as appropriate.

This WP will also investigate which technology can be reused or further exploited for making K-Space research more efficient. The result of this activity is a strategy for translating technology to different target groups, where we consider K-Space internal, external groups but closely linked to K-Space, external groups loosely coupled with multimedia research, and business as our main target groups.

The output of this WP can be thought of as the physical instantiation of the K-Space – a distributed research environment for resource sharing. It will consist of distributed repositories of partners' software, test data and results accessed via a central portal that supports remote use of these resources. In this way, partners' can share content without the need for lengthy file download/exchange so that partners can test their algorithms and systems on diverse content without ever actually possessing the content themselves. Similarly, whilst source code will be available, it will be possible to access and run partners' tools remotely thereby avoiding having to compile and work with large software projects developed by others. Similarly, some partners place significant emphasis and effort in user interface design for content-based operations, whilst others focus on analysis technology for knowledge extraction, whilst still others do both. Allowing access to various interfaces in a machine independent way will allow those who focus on analysis to benefit from others' effort in state of the art UI design, and vice versa. This type of cross-checking activity will aid evaluation of research results by providing a "level playing field" – for example, testing the performance of different search/retrieval algorithms under the same interface thereby removing front-end system variability from the benchmarking exercise, or conversely evaluating a user interface using different version of underlying search/retrieval technology.

Clearly, this task is not a purely research activity, however, we believe that this will be a key activity in order to stimulate research collaboration. For this reason, all partners are involved in this WP and will contribute to the design and instantiation of this distributed research environment. This will involve all partners identifying resources to be shared – both existing resources but also and more importantly those developed in the course of the project – and also ensuring that these resources are adapted according to the interfaces specified so that they can be shared in the distributed environment. For this reason, each partner will also contribute to the design and development of the required interfaces. Furthermore, significant manpower, over and above the individual partners' efforts in this WP, will be specifically allocated for the coordination of this task. The design, instantiation and maintenance of the distributed environment will be the full-time responsibility of a K-Space system administrator who will lead these activities supported by dedicated effort from all partners.

Activity WP6.1 Distributed Research Environment Design

Coordinating Organisation: Dublin City University (DCU)

Coordinator: Dr. Noel O'Connor

Participants: All network partners

Description: This activity has two main objectives:

- To investigate which technology can be reused or further exploited for making K-Space research more efficient. The result of this activity is a strategy for translating technology to different target groups, where we consider K-Space internal, external groups but closely linked to K-Space, external groups loosely coupled with multimedia research, and business as our main target groups.
- To design a suitable set of specifications that partners can conform to in order to integrate their resources into the distributed research environment.

Activity WP6.2 Research Resource Sharing

Coordinating Organisation: Dublin City University (DCU)

Coordinator: Dr. Noel O'Connor

Participants: All network partners

Description: The objective of this activity is to review the existing research resources available within the Network on an ongoing basis and collect these into (distributed) repositories that can be accessed via the distributed environment designed in WP6.1.

B.4.3 Activities to spread excellence (WP7)

K-Space plans to spread excellence in training, dissemination, and technology translation activities. Spreading excellence of the results and findings of research of this NoE will be targeting three groups. Academics, here the typical instruments known in academic communities will be used. The second group is industry/business players. Here we will use specific instruments so that both industrial players and academics can contribute and benefit. The third group is the specialist citizen. Here the aim is to tailor the results of the K-Space activity to benefit the EU citizens who will reap the benefits of the technology developed.

As a necessary prerequisite for the first two activities to be started and further on to be measured and evaluated, we will be defining a research map at the beginning of the project. This will include the current state-of-the-art; it will include the number of papers being submitted at conferences, workshops, journals, etc. in specific areas; it will include the number of PhDs working in theses areas; etc. These figures will provide the metrics for our activities both, as far as the academic communities are concerned and as far as the business communities are concerned. Therefore, the research map will build the basis for constant planning, controlling and self-assessment of our dissemination activities. The activities are mainly targeted at spreading the excellence to academic communities include the following general mechanisms

- Establishment of a conference series. The European Workshop on the Integration of Knowledge, Semantics and Digital Media Technology (EWIMT) has been identified as the main dissemination forum of the Network. This workshop will keep the character and scope fully aligned with the technical objectives of the NoE. It will serve not only to disseminate and demonstrate the main achievements of the network every year but also as primary feeding ground for networking and exchange of ideas with other members of the wide scientific community. We will form a permanent steering committee to set and maintain the scientific standards of this activity. One important objective of the NoE is to broaden participation to the point where it becomes the main Conference in the area. This conference will be one of the lasting achievement of K-Space.
- Participation in relevant conferences. Hereby the NoE will organize special sessions in academic conferences, e.g., ACM Multimedia, XML Europe, WIAMIS, etc. It will be important to give the special sessions a type of character such that a common thread will be visible. Different conferences within communities will be targeted: knowledge-based multimedia analysis is an interdisciplinary subject and there are several communities merging together.
- W3C Semantic Web Best Practices group in which K-Space members are actively contributing.
- Typical Academic dissemination: participation and presentation of research results in workshops and conferences; publications in academic journals; supervision of PhDs, diploma thesis, etc.
- Development of common curricula towards an European Master's programme.
- The training activities address young people, researchers of related fields, and application developers working in small to medium-sized companies. This activity stimulates recruitment and application, exchange between research communities, and academia and business.
- A joint publication on knowledge-based multimedia analysis: this will not be in the first phases of the NoE but towards the end of the second phase (i.e., after 3 years). Structure and contents of the publication will be inline with the development of common curricula. Given the subject – knowledge-based multimedia analysis – we will be taking this publication as a showcase, i.e., we will be demonstrating that users in different environments, with heterogeneous background, etc. will be able to consume and interact with that publication. With the new dissemination forums of K-Space in action, the activities of the network can be directed towards a long-term and world-wide impact.

Activities targeted at spreading the excellence to business and industry will be coordinated with the Industrial Advisory Board. It includes the following instruments:

- A2B workshops: we will explicitly invite relevant partners to give co-presentations at the workshops organised by the NoE. A2B is short for academia to business and by encouraging business people to comment on the research activities, making sure that both communities cooperate with each other.

- A2B summer school: organising yearly summer schools in different locations and with sessions held both by academic and industrial members of K-Space.
- Technology transfer activities: aiming at an efficient exploitation and reuse of internal as well as external technology; internal technology has been created by K-Space participants and external technology has been developed in related research fields, by big IT players or SMEs. With this activity, K-Space participants develop technology with the aim of exploitation and reuse; knowledge on IP and patents is shared and established in the network, and the individual gains support in placing their technology.

To enable the non specialist citizen access to the outputs of the technology that is being developed early results of this WP will be used to find out: what is interesting to the user, what is helpful to the user e.g. with different literacy skills and languages and conversely what may be technologically interesting but either confusing or not addressing features that user (i.e. viewer, listener, or traveller) needs. We would also consider disabled user (e.g., blind users will benefit from our audio research). After that dissemination activities will be tailored to these findings so that the common European citizen becomes an accessible target of the dissemination process. In summary, the activities to spread excellence aim at establishing excellent recruitment and application opportunities, new and efficient forms of dissemination with world-wide impact, and exploitation and reuse of technology. The activities are described in more detail in the following sections. Specifically, we will have the following sub packages:

Activity WP7.1 Website and Electronic Newsletter

Coordinating Organization:	University of Economics, Prague (UEP)
Coordinator:	Dr. Vojtěch Svátek
Participants:	All network members

Description: An important tool of dissemination/promotion will be constituted by the K-Space web site (WP7.1.1), which will ensure the delivery of some K-Space promotional material (information leaflet, electronic newsletter, etc.), of the calendar and outcomes of the organised events, and an effective information spreading, via a communication/discussion forum. The Web site will work as a portal, electronic archive or digital library of the community and store different types of documents: fundamental papers, training and teaching material, software, K-Space researchers' papers, test collections or links to them, Ph.D. or Masters theses.

Bimonthly Electronic Newsletter (WP7.1.2) will be an instrument for regular exchange of information among network members and the research community at large. The creation of a Newsletter dedicated to the K-Space initiative will constitute the primary means to collect the results achieved through the network activities, and to spread them. This Newsletter will be strongly related to the main initiatives in the field, so that the activities undertaken within K-Space will be properly connected within a more general and distributed research framework. The Newsletter will be conceived as a bimonthly publication, also published on the K-Space web site. The main objectives of this newsletter are:

- To report the main activities promoted and undertaken within the NoE context;
- To link to both European and international initiatives in the field, and;
- To publish papers (position papers, state of the art, reviews) of researchers involved in the network.

Activity WP7.2 K-Space Conference - The European Workshop on the Integration of Knowledge, Semantics and Digital Media Technology (EWIMT)

Coordinating Organization:	Queen Mary, University of London (QMUL)
Coordinator:	Prof. Ebroul Izquierdo, it will be hosted in different locations. The partner hosting the conference will become conference chair in that year.
Participants:	All members of the network

Description: This workshop will keep the character and scope fully aligned with the technical objectives of the NoE. It will serve not only to disseminate and demonstrate the main achievements of the network every year but also as primary feeding ground for networking and exchange of ideas with other members of the wide scientific community.

The workshop will be organized as a single-track event with special sessions on:

- Content-based multimedia analysis for annotation and retrieval
- Knowledge extraction for high-level multimedia annotation, search and retrieval

- Semantic multimedia

In addition, there will be a number of plenary talks featuring invited presentations that cut across and unify these three topics. Invited speakers will be drawn from industry and academia using the excellent existing links of partners to other world leaders both in the EU (e.g. via frame-work funded activities) and beyond.

Activity WP7.3 Towards a Scientific Forum in Multimedia Knowledge Extraction and Analysis

Coordinating Organization: German Research Centre for Artificial Intelligence (DFKI)

Coordinator: Thierry Declerck

Participants: All members of the network

Description: To ensure the persistence of K-Space beyond EU funding, the creation of a scientific forum in multimedia knowledge extraction and analysis is envisaged. Initially, the principles, problems and benefits of creating such forum will be discussed. This must be weighed carefully against alternatives such as affiliation to existing professional bodies which will inevitably be evolving to better represent the importance of knowledge-based media processing. This activity will strongly depend on the success of other activities in this WP.

Activity WP7.4 Joint Publications

Coordinating Organization: Ecole Polytechnique Fédérale de Lausanne (EPFL)

Coordinator: Prof. Touradj Ebrahimi

Participants: All network members

Description: Jointly publications will help to spread excellence outside the network and to enlarge the network audience. K-Space will sponsor and coordinate special sessions at important international and well established conferences (WP7.4.1). Already identified targets include but will not be limited to: European Workshop on Knowledge-based multimedia analysis and the European Workshop on multimedia interactive services (WIAMIS), International Workshop on Content based Multimedia Indexing (CBMI), International Semantic Web Conference (ISWC), European Semantic Web Conference (ESWC), Association for Computational Linguistics (ACL), International Joint Conference on Artificial Intelligence (IJCAI), ACM Multimedia**.**

Organization of Special Issues in leading journals (WP7.4.2), such as EURASIP, IEE Proceedings and IEEE Transactions. This activity will be facilitated by the fact that a number of partners already serve as associate editors or editors-in-chief of some of the most relevant journals including IEEE Trans. on signal processing, IEEE Trans. on circuits and systems for video technology, IEEE Trans. on image processing, IEEE Trans. on Multimedia, Eurasip Journals, International Journal of Metadata, Semantics and Ontologies, Journal of Web Semantics, International Journal on Human-Computer Studies, IEEE Intelligent Systems.

A related activity (WP7.4.3 - Books on knowledge-based multimedia analysis technology), which we target for later in the NoE is that at least one text book on "*Knowledge-based multimedia analysis technology*" will result. This will consist of a unified and coherent view of this multidisciplinary domain. It will include specially invited chapters putting in perspective the interaction between user needs and technology development in cross media and will not merely be a collection of papers.

Activity WP7.5 Short Courses and Training Programs

Coordinating Organization: Groupe des Ecoles des Télécommunications (GET)

Coordinator: Dr. Gaël Richard

Participants: All network members

Description: K-Space will create a significantly large library of relevant educational materials. An open call will be made for proposals within the network. These tutorials will cover most of the basic scientific/technological topics of K-Space and will be freely distributed under a GNU public license. These materials will be placed on the K-Space Web site and may include video recordings of courses, audiovisual and written materials. The created tutorial might be given as courses in the summer programs or in the different Ph.D. programs of the partner institutions. Tutorials will be strongly coupled with the Joint Research Activities covered in WP2-WP4. (WP7.5.1)

Several Network partners will invite seminar speakers to their institution (a common practice) and make this seminar available to the rest of the network, both by streaming the seminar live (web-casting) and making it

available as a download. K-Space believes that providing such access to leading edge seminars will broaden the horizons of researchers across Europe in an immediate and economical way. Once these seminars are released outside the NoE, they will act as a magnet, attracting external interest to our activities from research and industry alike, and promoting the excellence of what we are achieving more widely than the network membership. We also believe there is an opportunity to charge industry for this service in the future. (WP7.5.2)

The summer school program will be introduced to bring the young researchers in touch with the most promising research in the fields covered by K-Space. To this end, we propose to hold annual thematic summer schools, concurrently with the K-Space annual colloquium. These summer schools will consist of several tutorials delivered by researchers from the network, each of at least 1/2 day perhaps with hands-on practical work. Another aspect of the summer school will be a mini-conference, at which the students present their research (either as a poster or spoken presentation) to one another. Prizes and commendations will be awarded. Students across Europe will be able to apply for scholarships for attending this activity. A limited number of scholarships will be awarded to fund the associated travel expenses. (WP7.5.3)

K-Space will offer short courses for industry. These will provide attendees from industry exposure to the latest ideas and research results, and will be intensive, over 1 to 3 days. These will be based on Masters modules, though at a different level, and offering up-to-the-minute information which would necessarily suit an examinable Masters programme. Feedback from industry will help to shape and improve the offering to Masters students. This will be supplemented by materials made available over our web portal. (WP7.5.4)

It is believed that Post-graduate education is the key for promoting research and innovation in a given discipline. K-Space plans to devise ***European Masters programmes*** and modules designed to train the next generation of media technologists, content engineers and technology-aware content originators. It would also represent an essential path towards the harmonisation of high level education in Europe. This is a long term goal and will initially involve only a few of the partners. (WP7.5.5)

The first Master program will be launched in 2007, in which there will be sharing of materials across institutions (for example using the K-Space Tutorials) but each will teach its own students locally from those common materials. This is to ensure the robustness of the programmes before releasing to potentially large audiences. In the following year, and making reference to considerable experience in distance learning throughout the NoE, each module will be delivered from a single site over the Internet to students registered at a variety of partner institutions. Here we foresee that there is a significant opportunity in advanced training modules delivered ‘to the office’ by distance learning for students/engineers who are in full-time employment.

K-Space will also propose a ***European Ph.D. Program*** to pave the way for the achievement of this objective, several initiatives will be conducted:

- The establishment of a *co-supervision framework* to allow a student to have two supervisors from different universities/countries
- The introduction of special distinctions such as the *European Doctorate distinction* for Ph.D. thesis defended in front of a truly international defence committee.
- Promote a much stronger integration of doctoral programs between the universities of the network. Such integration would include signing of inter-university agreements to include common teaching stage and common research stage leading to an European mention for thesis carried out within this programme.

Activity WP7.6 Exhibitions and Demonstrations

Coordinating Organization:	Joanneum Research Forschungs-gesellschaft mbH, (JRS)
Coordinator:	Werner Haas
Participants:	All members of the network

Description: In order to maximize K-Space’s impact, this activity will consist in having an identifiable presence at important international meetings and exhibitions, such as IBC (International Broadcasting Convention). The NoE will, where deemed appropriate by the executive board, sponsor K-Space stands at which the research, training and other activities of the network can be promoted.

Activity WP7.7 Contribution to Standards

Coordinating Organization:	Technishe Universität Berlin (TUB)
Coordinator:	Prof. Thomas Sikora

Participants All members of the network

Description: Over the last ten years, significant steps have already been taken towards the development of consensual standards in the K-Space domain, thanks to a number of ongoing international initiatives such as ISO/TC 37/SC 4, SMPTE, ISO MPEG-7 and ISO JPSearch. K-Space will actively participate and contribute to these and other standards bodies with the expectation of having a significant impact on the development of these standards. In particular, K-Space will address issues such as content description (metadata), user preferences and content adaptation and transcoding, which are in the scope of MPEG-7 and MPEG-21 as well as JPSearch.

Activity WP7.8 Technology Transfer

Coordinating Organization: Institut Eurécom (EURECOM)

Coordinator: Prof. Bernard Merialdo

Participants All members of the network

Description: The technology transfer activities aim at an efficient exploitation and reuse of technology. The activity is closely linked to the creation of platforms and tools in K-Space.

Technology translation is related to markets, intellectual property (IP) and legal instruments such as patents and contracts. Many researchers feel more hindered than inspired when dealing with those non-academic market rules. However, different from the past, market rules infiltrate more and more academic research, one reason lies in the constantly growing financial pressure on organisations. In particular for European research, we have to realise that for achieving a stronger world-wide impact of European research results, researchers should pay more attention to market rules. A major aim of K-Space is to combine positively research and market rules. Thereby, K-Space will address and encourage the discussion of the negative and positive influences of market rules on research.

Several members of K-Space have experience with IP and markets, and with K-Space in place, we will dedicate effort towards removing some of the boundaries between academia and markets. Thus, we will direct K-Space European research towards a fruitful exchange between academia and business. In the long term, we achieve with this strategy a stronger impact of European research.

For achieving this aim, the taskforce will execute the following activities on technology translation:

- Identify internal (K-Space) and external (related research areas, big players, SMEs) technology/knowledge. The result of this activity is a report about multimedia technology that has been developed, used, or is under development.
- Establish in K-Space knowledge about IP and patents. The result of this activity is a forum in which we collect and discuss the boundaries and benefits IP brings to research. K-Space members with connections in the IP area will invite junior and senior representatives of IP-related companies.
- Investigate the requirements of teams external to multimedia research. With an appropriate work force in place, we would reflect the research vision of K-Space members with the requirements collected from external researchers and companies. The result of this activity is a research strategy for directing K-Space and multimedia research in Europe.
- Establish an K-Space forum (workshop) that aims at translating technology to researchers in related fields and SME's. The outcome of a workshop shall be the use of research technology in related fields or business. The participation of externals in such a workshop needs to be planned carefully, since enough incentive has to be created for involving externals successfully. The size and power of K-Space is already an incentive in itself. In addition, K-Space stimulates the participation by building a bridge between research, IP and patents, and investors.

Apart from dissemination, the direct benefit of technology transfer for research and the academic career of an individual is not certain. The nature of research directs scientific efforts towards publication rather then technology transfer. With growing financial pressure on academic institutions, we observe currently that academic institutions increase their efforts in technology transfer so to achieve a more efficient exploitation of the research results of their staff. K-Space will meet and support this requirement of academic institutions.

B.4.4 Consortium management activities (WP1)

The management activities are designed to guarantee that the project runs smoothly by ensuring that the goals are clearly defined and understood. The management structure of the Network consists of three main

hierarchical layers: Administration Office, Network Steering Board and the Workpackage Teams, see Fig. 5 in section B7. The Network Steering Board is chaired by the project coordinator. The management committees are supported by the K-Space Administration Office and will seek advice from an independent Board of Scientific Advisors, the composition of this board, its tasks and role in the Network is elaborated in section B7. The Administration Office is the Network secretariat and management support. It is headed by the Administration Executive, who is a professional full-time manager dedicated to the day-to-day network management. The Administration Executive will be appointed by the coordinating organisation and will be responsible for all NoE business on a day-to-day basis. He/she acts on behalf of the Network Steering Board. Quality Assurance will be provided by a team of network members: The Quality Assurance Committee. It will ensure that Quality Assurance is addressed in all aspects and activities of K-Space.

The Network Steering Board consists of five senior members of the network from five different institutions: The project coordinator, the integration and excellence spreading executive and three executives representing the Joint Research Activities of the Network. The project coordinator is the chair of the Network Steering Board and will be designed by the coordinator partner. Important issues like financial planning and updated JPA will be decided upon the Network Steering Board on a regular basis. Aiming to strike the right balance between representation and efficiency the day-to-day decision making is undertaken by the Administration Office on behalf of the general assembly represented by the Network Steering Board. A more detailed description of these management bodies and executives along with their roles, functions and responsibilities is given in B7. The following is the description of Network management activities.

Activity WP1.1 Management Charter

Coordinating Organization: QMUL

Coordinator: Administration executive

Participants: All members of the network

Description: The formal and legal mechanisms required in the network are clearly specified in the Consortium Agreement. However, this task defines and set up the practical mechanisms to implement the terms of the Consortium Agreement.

Activity WP1.2 Communication with the EU Commission

Coordinating Organization: QMUL

Coordinator: Chair of the Network Steering Board

Participants: Members of the CO and Administration contacts of each partner

Description: One staff member from each partner is appointed as administration contact to interface with the administration manager. This way, there is a clear communication interface between the commission and the NoE. For the production of the progress reports that will be ratified by the Network Executive Board, the administration managers will rely on the expertise of the Network Executive Committee.

Activity WP1.3 Financial Planning

Coordinating Organization: QMUL

Coordinator: Administration executive

Participants: All members of the network

Description: A detailed financial plan will be written by the administration executive, based on the outline financial plan of the project and the recommendations of the CO. This plan will be used to review the financial status of the project on a regular basis, and used to generate reports to the Network Executive Committee.

Activity WP1.4 Accounting and Financial Audits

Coordinating Organization: QMUL

Coordinator: Administration executive

Participants: Administration contacts of each partner

Description: It will ensure that financial audits as required by the EU are being implemented in the network. If needed the administration manager will use network funds for the auditing procedure. Based on the accounting figures, future budgets will be planned and overspending will be limited.

Activity WP1.5 Handling of Legal and Ethical Matters

Coordinating Organization: QMUL

Coordinator: Administration executive

Participants: Members of the CO and administration contacts of each partner

Description: This activity will cover the way that partners behave with respect to each other according to the terms of the Consortium Agreement. It will deal with the liability of partners, partner withdrawal procedures, the settlement of disputes, the responsibilities of partners regarding accurate and timely reporting of difficulties, confidentiality, including the difference between foreground and background information, IPR, including arrangements for licensing and special duties of the coordinating Partner.

Activity WP1.6 Concertation, Consensus and Clusters

Coordinating Organization: Employer of the Integration Executive

Coordinator: Integration Executive

Participants: All network members

Description: The Network is committed to the exchange of information and integration with other related projects in the framework of Clusters or other concertation mechanisms that might be established in order to achieve the overall project vision. This task will identify potential for clustering and use diverse project activities to perform concerted actions with other networks and projects.

Activity WP1.7 Overall Coordination of the Joint Activities of the Network

Coordinating Organization: QMUL

Coordinator: Chair of the Network Steering Board, supported by the Administration Executive

Participants: Members of the Network Executive Committee and Workpackage Leaders

Description: This is the main activity and main task of the Network Executive Committee. The progress of individual actions and achievements in the corresponding activities will be supervised by the WP leaders who report to the Project Executive Committee. The Network coordinator (Chair of the NEC) will ensure that relevant information on NoE progress and status is being exchanged among the members of the Network Executive Committee. Using this information the Network Executive Committee can quickly identify if changes are needed and efficiently decide what corrections or new actions should be implemented.

Activity WP1.8 Quality Assurance and Technical Auditing

Coordinating Organization: Employer of the leader of the Quality Assurance Committee

Coordinator: Leader of the Quality Assurance Committee

Participants: All network members

Description: The Quality Assurance Committee will ensure that relevant technical activities are audited as required by the EU. All deliverables and internal action reports will undergo internal reviews. The outcome of the review and following discussions will be used to set new directions and corrections if required.

Activity WP1.9 Gender and Social Issues

Coordinating Organization: QMUL

Coordinator: Administration Executive

Participants: All network members

Description: The Administration Executive will use his/her close links to the administration contacts in order to ensure that gender and social issues policies are being implemented. Wherever difficulties arise, the Administration Executive will take necessary steps to make sure that partners conform to these network policies. If the need for further regulation is identified, the Network Executive Committee will delegate this decision to the Network Steering Board.

B.5 Description of the consortium and the excellence of the participants

B.5.1 Consortium overview complementarity and synergies

K-Space is a network that addresses an issue of significant importance to Europe's social and economical concerns in knowledge-based multimedia analysis. It is a large project, which requires extensive resources and distribution of responsibilities; it is a scientific project, which is highly dependent on human intellect; it is a cross-disciplinary project in need of a diversity of expertise; it is an application project which needs state-of-the-art technological support; it is a holistic project that thrives on synergy of collaborative activity; and it is a global project reliant on input from varied perspectives. The NoE instrument of the Framework 6 programme provides a unique opportunity for such a large multifaceted, multidiscipline project. However, it is recognised that any undertaking of this scale can be highly demanding as well as rewarding. To this end, the significance of the composition of the consortium was realised at the outset. In order to build the consortium and to prepare the proposal a core group of five research institutions with focused expertise on the different technical areas of the NoE. Once the strategic objectives of FP6 were made public, a careful screening of research institutions across Europe resulted in the identification of most of the consortium partners. This was followed by several phone conferences and participations in concertation and information meetings to help to develop the overall network structure, identify responsibilities and synergies and refine the project proposal. This was later coupled with several horizontal meetings amongst partners and a number of collective meetings. Consequently, a solid consortium was formed the members of which build clusters highly complementary in knowledge-based multimedia analysis research and are fully committed.

K-Space brings together a critical mass of **14** leading research institutions from **9** different countries across Europe. All the K-Space partners are internationally renowned for their world-class research on areas relevant to the technical scope of the NoE. Each partner brings unique expertise and skills which overlap or complement to each other. The main strength of the consortium is the unification of the partners to build a Network focusing on research areas that partners believe will benefit from dedicated and strong integration efforts. The consortium expertise represents the know-how, commitment and competence that is absolutely necessary to undertake the technical, dissemination and further integration aspects of the NoE. The diversity is required to secure the complementarity of contributions in the targeted multidisciplinary area.

The Multimedia and Vision Lab at QMUL headed by Prof. E. Izquierdo is well recognized for its expertise in multimedia analysis. It is complemented by ITI, DCU and TUB which have conducted close cooperation in several projects including IST SCHEMA, EU COST211 and QIMERA. The FP5 IST NoE "SCHEMA: Network of Excellence in Content-Based Semantic Scene Analysis and Information Retrieval", aims to bring together a critical mass of universities, research centres industrial players and end users in order to improve the systematic exchange of information by the forging of links between partners. SCHEMA is coordinated by Prof. M. Strintzis and Dr. Y. Kompatsiaris (ITI) two main contributors in K-Space.

The European COST 292 Action (Semantic Multimodal Analysis of Digital Media) is another example of ongoing collaboration between K-Space partners. This action is coordinated by the Multimedia and Vision Lab at QMUL. Through it, QMUL, TUB, EPFL, ITI and DCU have participated in common research initiatives, exchange of information and joint software development in the area of knowledge-based multimedia analysis. DCU, QMUL and ITI are currently developing and exchanging visual analysis software as part of the voluntary Qimera initiative (www.qimera.org) to produce a software test-bed for video object segmentation and tracking. This initiative is coordinated by Dr. Noel O'Connor from DCU.

TUB and EPFL have been instrumental in the development of MPEG7, with contributions from most of the other consortium partners. Both institutions are among the leading world force regarding R&D in the domain of audio-visual analysis. Both labs combined comprise of more than 50 researchers active in the field. Prof. T. Sikora (TUB) and T. Ebrahimi (EPFL) have worked together very closely in the past and continue to do so today. This cooperation naturally covers the area of research where the two partners have conducted joint work for a very long time. This cooperation also extends to standardisation activities mainly within the ISO MPEG (Moving Pictures Experts Group) framework, where both partners are heavily involved. Bringing together the high reputation of both institutions, Professors T. Sikora and T. Ebrahimi have jointly organised several workshops and conferences. It is planned to intensify these links by increasing the number and the specialisation of joint workshops. The links between these universities are not confined to research and related activities only. Every year, a large number of undergraduate students choose to take part in exchange programmes between the two schools, the best-known of which is ERASMUS.

ITI, UniFI, QMUL and GU work on dynamic thematic categorization as well as detection of events and composite objects from low- and medium-level content descriptions, based on semantic knowledge representations and ontologies.

Main researchers of KU and DFKI have worked together in the area of semantic annotation since 1998 in the German GETESS project. Also after the end of that project they were instrumental in the development of new annotation tools and ontology learning capabilities. KU and ITI have cooperated closely and successfully in the EU IST project aceMedia. Their common tool "OntoMat VDE" is a key cornerstone based on which knowledge extraction from multimedia may be built. KU is involved in the EU IST project Adaptive Services Grid on a decentralized infrastructure for heterogeneous and computing intensive services, which again may be needed in computing intensive multimedia analysis.

JRS with its strong link to broadcast archive institutions (e.g. from the past Presto and DIAMANT as well as the ongoing PrestoSpace project) has formerly worked together with TUB. K-Space allows to broaden this collaboration.

DCU either currently collaborates, or has collaborated in the past, with a number of K-Space partners. DCU and GU were both members of the EU-funded MIRA project. DCU, QMUL and ITI were all members of the SCHEMA EU FP5 Network of Excellence. Currently, these three partners collaborate in the context of the aceMedia FP6 Integrated Project, along with two members of the Industrial Advisory Board – Motorola Research Labs UK and Telefonica I&D. In the past DCU, EPFL, TUB and ITI have all been members of the COST 211 action. DCU has collaborated with INA and Telefonica in EU ACTS projects. DCU has collaborated directly with British Telecom PLC in the past

The Multimedia and Human-Computer Interaction group (INS2) at CWI has been involved with the development of models and authoring systems for multimedia and hypermedia since the early 1990's. In that time the group has had an active exchange of ideas with institutions such as INA, DFKI and Glasgow University. In particular in recent years the complementarities with work done at Koblenz University became apparent. Relevant Dutch consortia are Passepartout and MultimediaN. Passepartout, part of the European, ITEA, Jules Verne project, will use Semantic Web technologies to generate personalized hypermedia presentations for personal devices.

MultimediaN involves the knowledge creation and transfer on handling of video, pictures, audio, and language in ICT. With user customization from 20 organisations in industry, government and non-profit organizations about 60 scientists are developing new software at the edge of new video, audio and speech technology.

INA and DCU have collaborated from 1998 to 2001 in the Diceman IST project. INA has also informal exchanges on relevant domains with GET, Eurecom and EPFL.

The Institut Eurécom has a strong record of national and international cooperation, in particular with industrial companies. We are currently participating to two European projects, one lead by Philips Research Lab, one lead by Portugal Inovacao. We are also a regular participant in the Trec Video experiments, which provide regular benchmarks for video analysis and search algorithms and systems. Our group is starting two national cooperations on algorithm evaluation (ARGOS & ROBIN), with the sponsorship of the French ministry of Research. We are also initiators and active in the organization of the CBMI international workshop (next edition will take place in Riga, in June 2005).

GU and DCU have been collaborating on information retrieval projects in the past. They were the members of the EU funded MIRA, project and have been conducting collaborative work, personal exchanges and organisation of conferences in the past. Similarly, GU and QMUL are members and participats of the EPSRC supported MMKM network.

The language technology Lab of DFKI in Saarbruecken has been involved in several EU projects dealing with the use of language technologies for the semantic indexing and retrieval of multimedia material. The contact person for this NoE was also involved in the EU project Esperonto on bridging the gap between the actual Web and the Semantic web, also investigating status of the automatic text-based semantic annotation of pictures present in the web. Within Esperonto he was involved as affiliated member in the SCHEMA Network of Excellence in Content-Based Semantic Scene Analysis and Information Retrieval. Together with Prof. Elisabth André (Univeristy of Augsburg) and Yiannis Kompatsiaris (ITI), he proposed a lecture on "NLP for Multimedia Applications" at the 16th European Summer School in Logic, Language and Information in Nancy (ESSLLI 2004). A new edition of this lecture will be held at ESSLLI 2005 (Edinburgh). He also co-chaired with Siegfried Handschuh (University of Karlsruhe) the ISWC 2004 Workshop on Knowledge Markup and Semantic Annotation, opening the topics to the Semantic Annotation for Multimedia material.

TUB is an active MPEG member with activities in MPEG-4 audio and MPEG-7, and as well as in 3DAV. Our department is involved in the VISNET project and will be engaged in the upcoming VISNET-II project. Both VISNET projects are "Networks of Excellence" regarding networked audiovisual media technologies. Another currently involvement is the 3DTV project (see http://www.3dtv-research.net/index.php), a European ”Network of Excellence” funded by the EC 6th Framework IST Programme. The goal of this project is to provide solutions for integrated three-dimensional television, thus research activities covers capturing, transmission and display of three-dimensional scenes for home entertainment solutions.

The FP6 IST IP “aceMedia” is an ongoing collaboration of K-Space partners. ITI, KU DCU and QMUL are participating in one of the leading European integrated projects in knowledge-based multimedia analysis and retrieval. The aceMedia project aims to bring together the collective expertise of multimedia and knowledge technology experts to drive research on next generation tools and management for multimedia content, which will establish the EU as a leader in this field. In order to simplify the user experience, the aceMedia project focuses its efforts on knowledge discovery and self-adaptability embedded into media content, which will allow it to be self organising, self annotating, and more readily searched and communicated.

ITI, EPFL, TUB and UEP are participating in the FP6 IST NoE “KnowledgeWeb”.

Supporting the transition process of Ontology technology from Academia to Industry is the main goal of Knowledge Web. The mission of KnowledgeWeb is to strengthen the European industry and service providers in one of the most important areas of current computer technology: Semantic Web enabled E-work and E-commerce. The project concentrates its efforts around the outreach of this technology to industry. Naturally, this includes education and research efforts to ensure the durability of impact and support of industry.

The University of Economics, Prague (UEP) co-operated with CWI in the organisation of collaborative effort in Knowledge Discovery in Databases (Discovery Challenge). With DFKI it co-organised an ECML/PKDD workshop on Knowledge Discovery and Ontologies.

B.5.1.1 Partner contributions to the JPA

The following table summarises the main contributions that each partner bring to the network.

Table 3 K-Space partners and their main contributions to the Network

No	Partner name	Contribution
1	Queen Mary, University of London	Coordinator, leader of WP1, design of efficient systems for semi-automatic annotation using inference rules and low-level descriptors. Automatic classification of visual information using low-level and medium-level descriptors fuzzy logic and evolutionary learning. Knowledge acquisition from past experience through user interaction - relevance feedback- and adaptive learning.
2	Koblenz University	Semi-automatic annotation by human-computer interaction and learning from third re-sources (WWW, other data). Ontology-based heuristic inference rules for recognizing complex objects or events from low level features of multimedia sources.
3	Joanneum Research Forschungsgesellschaft mbH	Leader of WP3. Content structuring by multimodal analysis (video & audio shot boundary detection, camera movement, visual and acoustic scene classification), standardised content description and metadata profiles suitable for targeted application domains, content description and analysis infrastructure.
4	Informatics and Telematics Institute	Leader of WP4, carrying out research on knowledge extraction from multimedia documents using multimedia ontologies, content analysis algorithms and reasoning processes. The main contributions of ITI are semantic segmentation algorithms, construction of multimedia ontologies, development of multimedia descriptor management tools, and matching processes using intelligent algorithms and adaptive networks. Automatic recognition and labelling using specialised reasoning processes, context modelling, reasoning using context, are also research directions of ITI that will play an important role in WP6 of K-Space.

5	Dublin City University	Leader of WP6. Semi-automatic content annotation using machine learning knowledge extraction techniques that leverage low-/mid-level audio-visual features. Content categorisation for dynamic archive organisation based on automatically extracted features. Object-based search and retrieval with relevance feedback for learning object classes. New user interface design paradigms for browsing and search and retrieval considering both content-based and non-content-based features for indexing as well as the user's context.
6	Centrum voor Wiskunde en Informatica	Participant in WP5 and coordinator of WP5.3, design of methods that facilitate semantic-based interaction with multimedia in various user and domain contexts. Establish relevant annotations for user-dependent presentation generation. Use of semantic annotations of media to enhance presentation of information to the user. Close connections with W3C (group collaborates with co-chair "Semantic Web Best Practices" group in 2 projects; head of W3C Benelux office and head of W3C offices are based at CWI.
7	Groupe des Ecoles de Telecomunications	Participant in tasks on content-based multimedia analysis, audio/speech/image processing, emotion analysis, 3D image indexing, multimodal techniques, high dimensionality reduction, low-level feature fusion, data mining, knowledge-assisted annotation of audiovisual content.
8	Institut National de l'Audiovisuel	INA brings its experience on cross-media indexing of large volumes, on manual and semi-automatic description, on designing description processes and tools adapted to uses, for content retrieval or publishing multiples versions of a same content intended to different people and/or media. INA is also a cross point between contents, users, producers, broadcasters and archivists.
9	Institut Eurécom	Eurécom expertise is in Multimedia Indexing and Information Filtering. We contribute on video analysis, object extraction, probabilistic model construction, semantic classification and modelling.
10	University of Glasgow	Leader of WP7 and the tasks on data mining. Context sensitive information retrieval- modelling context and knowledge acquisition from past experience through user interaction. Development of adaptive retrieval methods and user profiling techniques. Development of data mining techniques. Video segmentation, event detection and summarization techniques. Context sensitive and collaborative image retrieval. Theoretical approach to information retrieval.
11	German Research Centre for Artificial Intelligence	Leader of WP2. DFKI will mainly add expertise for integrating the results of semantic annotation of complementary sources to multimedia material. The main interest lies in the merging of descriptors for natural language, semantic web and multimedia descriptors.
12	Technische Universität Berlin	Design of efficient systems for automatic and semiautomatic annotation of speech, audio, images and video information using low-level and medium-level descriptors, relevance feedback- and adaptive learning.
13	Ecole Polytechnique Fédérale de Lausanne	Contribute to content-based multimedia analysis, low and medium-level signal processing, multimodal techniques, data fusion. Contribute to dissemination activities as well as MPEG and JPEG standards (MPEG-7, MPEG-21, JPSearch), development of new undergraduate/graduate teaching programs, short courses and technology transfer.
14	University of Economics, Prague	Coordinates WP5.5. Mining tabular databases associated with multimedia. Modelling the context of multimedia creation and exploitation.

B.5.1.2 Partner profiles

Queen Mary, University of London, (QMUL): QMUL is the third largest constituent college of the University of London. It is a major research institution in the UK and committed to high quality teaching. Both the Multimedia and Vision Research Laboratory and the Intelligent Systems Laboratory enjoy a distinguished reputation for innovation and the use of imaging and multimedia techniques to real world applications, receiving direct funding from overseas organisations such as Nokia, the Department of Defence and the EU. Much of the groups' work has been in the context of European Union research projects, such as: ACTS MOMUSYS, SAMBITS, PANORAMA, IMPACT and MARINER; Esprit UNITE; Basic Research DRUMS; IST SHUFFLE, CRUMPET, CORAS, TORRENT, AGENT-LINK, BUSMAN, SCHEMA and aceMedia. The groups are also involved in the MPEG-7 activities. The Multimedia and Vision Research Laboratory is the coordinator of the European COST292 forum in Semantic Multimodal Analysis of Digital Media and member of the steering group of the UK EPSRC Network on Multimedia Knowledge Management (MMKM)

Background work will be on the design of semiautomatic semantic annotation using inference rules and low-level descriptors as well as relevance feed-back for annotation. The exploitation of immune system mechanisms and evolutionary learning approaches to recognise and perform information synthesis and knowledge structuring.

Koblenz University, (KU): KU has a track record of over 25 years of teaching and research in computer science. Koblenz University is well-known for its institutes of computational visualistics with a faculty of 6 professors focusing on the need to analyze and create multimedia as well as for its institute of informatics, with several renowned researchers investigating the possibilities of inferencing for means such as knowledge management, infrastructure services, information retrieval, security – and knowledge extraction from multimedia. Much of the group's work has been in the context of national and European funding, such as: EU IST aceMedia, EU IST ASG, German BMBF Verisoft, German DFG KeY, DFG MoDeDok, or DFG Robolog.

Background work will be in the area of reasoning, semantic annotation, data mining of third-party resources (such as WWW) and knowledge extraction from low level multimedia descriptors.

Joanneum Research Forschungsgesellschaft mbH, (JRS): The digital media group at the JRS' Institute of Information Systems & Information Management is active in the field of content based multimedia-indexing since about 1997 when we proposed and co-ordinated the EC project VICAR (Video Indexing, Classification, Annotation and Retrieval). We have co-ordinated or participated in a number of similar projects with a focus of applying CBMI in audiovisual/broadcast archives and the media-industry. Our current research focus is on spatio-temporal video object segmentation, content based search & retrieval and video summaries. As metadata standard for our work we are relying on MPEG-7, where we are developing a MPEG-7 repository based on a full C++-implementation of the standard (relying on an automatic, configurable XML Schema (XSD) to C++ translator implemented in-house). Another application we have developed is the digital film restoration system DIAMANT which is also an excellent example of the application of content aware image processing.

Informatics and Telematics Institute (ITI) & Centre for Research and Technology Hellas (CERTH): ITI-CERTH was founded in 1998 as a non-profit organisation under the auspices of the General Secretarial of Research and Technology of Greece (GSRT), with its head office located in Thessaloniki, Greece. Since 10.3.2000 it has been a founding member of the Centre of Research and Technology Hellas (CERTH) also supervised by the GSRT. The most important related areas of R&D activities performed by ITI-CERTH include: image and video analysis, multimedia indexing and retrieval, informational retrieval and knowledge discovery for semantic-web applications, intelligent human computer interaction and intelligent agents, MPEG-7 and MPEG-21 standards. The Thessaloniki-based Information Processing Laboratory (IPL) of ITI-CERTH is participating in more than 20 EC IST projects and 43 National projects, and is the co-coordinator of four EC IST projects. Over the last five years, the ITI research team has authored over 85 publications in scientific journals and over 185 presentations to international conferences. Its Athens-based Image, Video and Multimedia Systems Lab (IVML) of the National Technical University of Athens (NTUA) will also collaborate in the project. It has led more than 50 European and national projects in the last decade, has authored more than 80 publications in scientific journals and over 180 in international conferences in the multimedia and knowledge technologies field.

Dublin City University, (DCU): The Centre for Digital Video Processing (CDVP) at Dublin City University is an inter disciplinary University Designated Research Centre which performs basic and applied research into the technologies necessary to support efficient management of large collections of multimedia

information, specifically repositories of video information. The specialty of the CDVP/DCU has been audio-visual analysis for advanced feature extraction, which in turn supports content manipulation. This specific niche area has been targeted because the expertise of researchers in the CDVP covers A/V analysis on the one hand, and information management on the other. The CDVP also conducts research into browsing and search interfaces, video access from mobile platforms, video navigation for safety and security applications, 3-D and multi-modal imaging and design of low-powered mobile devices for video processing. The CDVP comprises 6 faculty, 7 post-doctoral researchers and over 20 graduate students. Members of the CDVP have worked on many framework projects, have assumed the roles of National representatives to ISO MPEG as well as being leading participants in the US NIST-funded TRECVID annual video IR benchmarking activities. A spin-off company, Aliope Ltd, has been created to commercialize the research outputs of the CDVP.

Centrum voor Wiskunde en Informatica, (CWI): CWI is the research institute for mathematics and computer science research in The Netherlands. CWI has an outstanding international reputation, is an ERCIM member, and is also strongly embedded in Dutch university research. The Multimedia and Human-Computer Interaction group (INS2), part of the Information Systems cluster (INS), is renowned for its innovative work on all aspects of automated and semi-automated multimedia presentation authoring and presentation generation. Results of this work include the Amsterdam Hypermedia Model, contributions to the W3C SMIL 1.0, SMIL 2.0, and XHTML recommendations, the hypermedia authoring system GRiNS, and the CWI spin-off company Oratrix. Members of the group have been active in W3C's XHTML and SYMM Working Groups and ISO's MPEG7 DDL Working Group. Members of the group are currently participating in the W3C Semantic Web Best Practices group which aims to provide use-cases for developers of Semantic Web applications. The group receives funding from national as well as international research projects, such as the NWO projects I2RP, NASH and CHIME, the large Dutch funded MultimediaN project, the Dutch project Passepartout (as part of the European ITEA Jules Verne project) which includes strong industrial support from Philips; members of the group are currently affiliated with the European Network of Excellence on Digital Libraries (DELOS).

The group will work on mechanisms for the use and creation of semantic metadata at the user interface level. Here in particular aspects of manual and semi-automatic semantic annotation during the authoring and automatic generation of multimedia presentations will be investigated. Related to these issues is the work on semantic-based presentation of multimedia.

Groupe des Ecoles des Télécommunications, (GET): GET is made up of six major Graduate Schools of France in the field of Information Technology: Télécom Paris (ENST) - Ecole Nationale Supérieure des Télécommunications, ENST – Bretagne, INT – Evry, ENIC - in partnership with the University of Lille, EURECOM in partnership with EPFL, and IAAI - Institute of Advanced Applications of Internet, in collaboration with the Université d'Aix-Marseille. GET assembles around 50 laboratories addressing all issues related to the Information Society Technologies. GET research encompasses information theory, coding, modulation, detection, compression, classification, speech recognition and synthesis, audio signal processing and indexing, vision, biometry and software engineering, cognitive sciences, databases, data mining, and natural languages. Research conducted in the GET institutes contributes to most of the major European programme and initiatives in the ICT field, including Esprit, ACTS, IST, Eureka, and COST. GET has participated in more than 30 such projects or initiatives related to K-Space topics. To exemplify multidisciplinary research, GET is managing the "Mobile Campus Project" that federates various knowledge fields such as hardware and software infrastructures for mobile computing, communication and synchronization techniques, structured document and hypermedia, human-computer interfaces, pattern recognition and the evaluation of usages in which K-Space topics have a prominent role.

Institut National de l'Audiovisuel, (INA): INA is a public-owned industrial and commercial company. It is involved in many aspects of the audiovisual industry: commercial and patrimonial archiving, restoration, professional training, technical research, socio-economical studies, and experimental productions. INA Archives Department is responsible for collecting, restoring and communicating the French radio and television heritage, and for the commercial transfer of archive-related rights. It holds French radio material since 1933 and television material since 1949. Since a law was voted in 1992, radio and television programmes now fall within the compass of the legal deposit, this task having also been devoted to INA. Researchers, teachers and students may therefore have access to parts of INA's databases. INA's Research Laboratory is divided in two main teams, one working on audiovisual preservation, restoration and content protection (TTA), and the other one working on audiovisual content description (DCA) which is involved in K-Space. DCA is involved since 1998 in automatic audiovisual analysis and indexing of the audiovisual programmes as well as in metadata modelling, representation and management. It has participated and is

participating in many research projects related to K-Space, funded by the European Commission and the French Ministry of Industry including ESPRIT DiVAN, ACTS DICEMAN, EURODELPHES, IST ECHO, OLIVE, CHAPERON, OPALES, etc.

Institut Eurecom, (EURECOM): Institut Eurecom, Sophia Antipolis, France, is a graduate education and research centre, funded by two schools: Telecom Paris and EPFL (Lausanne, Switzerland), with several academic and industrial members. Our research activity is organized in three themes: mobile, corporate and multimedia communications. We have a very active collaboration program, and participate in many projects at the national and European level. Research at Eurecom includes in particular topics such as signal processing, information theory, speech processing, watermarking, biometry, multimedia analysis, information filtering. The quality of the research is often recognized internationally (the Institute has obtained 5 best paper awards in the last 2 years). The Institut Eurecom has been recently associated to the Consortium. Our group currently participates in the Trec Video experiments, where we apply our region classification approach to semantic feature extraction. We are the scientific coordinator for a national project (ARGOS) on evaluation of video analysis techniques that is being organized in 2005 and 2006.

University of Glasgow, (GU): The information retrieval group at the Department of Computer Science, University of Glasgow, Scotland is an international leader in the area. This group is involved in a number of national and international activities and is currently organising an IR festival in Glasgow bringing world leaders in IR to Glasgow. They are involved in the organisation of premium IR conferences (SIGIR, ECIR etc.) and participants of TREC and other activities. This group gets funding from UK funding bodies (EPSRC), EC and commercial companies (SHARP, Microsoft). The researchers have expertise in the following areas. IR models based on context logics and probability theory, situation theory, ostension and computational linguistics. Large scale IR experiments with text, multimedia. Usability and user-centred design. Evaluation methodologies for IR. Theoretical models for IR.

German Research Centre for Artificial Intelligence, (DFKI): The German Research Center for Artificial Intelligence Intelligence, founded in 1988, is one of the largest non-profit contract research institutes in the field of innovative software technology based on Artificial Intelligence (AI) methods. Research and development in language technology is carried out mainly at the Saarbrücken site in the LT Lab, whose director, Prof. Hans Uszkoreit, also holds a chair in Computational Linguistics at the University of the Saarland. The Language Technology Lab of the German Research Center for Artificial Intelligence Intelligence (DFKI), whose director Prof. Hans Uszkoreit, also holds a chair in Computational Linguistics at the University of the Saarland, has accrued much experience by successful coordination of and participation in various EU research projects, from which OLIVE, POP-EYE, TWENTYONE, MUMIS are particularly relevant for K-Space, since they were exploring the use of various language technologies for indexing and accessing multimedia content material. The LT-Lab also plays an active role in standardization activities, like for example in the ISO TC37/SC4 committee on language resources management. A main contribution of DFKI will lie in the use of knowledge extracted from complementary (language) sources for supporting the automated semantic annotation of multimedia material.

Technische Universität Berlin, (TUB): TUB is the largest technical universities in Germany with a world-wide reputation. The Audiovisual Signal Processing Lab and Communication Systems Group is directed by Professor Sikora and comprises of more than 40 researchers. Its teaching and research activities encompass most areas of digital signal processing for multimedia applications. The main focus of research is on analysis, description, classification, and coding of speech, audio, and video data. Researchers of the department have been instrumental in developing multimedia standards. Prof. Peter Noll was the MPEG Audio Chair between 1990 and 1995 responsible for the development of the MPEG-1 and MPEG-2 audio and speech codecs, including MP3. Prof. Thomas Sikora acted as the MPEG Video Chair between 1995 and 2000 responsible for the MPEG-4 video codec and MPEG-7 visual description standards developments. Currently the department is instrumental in the development of the MPEG-4 Audio Lossless Coding standard. The department activities regarding feature extraction and processing covers both the low-level as well as high level feature extraction.

Ecole Polytechnique Fédérale de Lausanne, (EPFL): EPFL is one of the two Federal Institutes of Technology in Switzerland with main emphasis on teaching and research in Engineering Sciences and Technologies. EPFL participation to this project is from a research team headed by Prof. Touradj Ebrahimi, which is active in research and teaching in the field of visual information processing and coding. The team is made of 3 post-doc researchers, 6 graduate researchers pursuing PhD theses, and between 5 to 10 undergraduate students. The research topics span through three highly interconnected disciplines of imaging, namely, compression, processing, and security. Compression includes still image, video and 3D image coding. Processing includes image and video analysis for interpretation and telecommunication such as

change detection, feature point extraction and tracking, object segmentation and tracking, compressed domain processing, and multimodal man-machine interface for interactive communication. Security activity includes development of algorithms for copyright protection, conditional access and authentication of images, video and 3D models. In addition to the above, the team is very active in MPEG and JPEG standardisation activities, where it contributes both at the technical and leadership levels.

University of Economics, Prague, (UEP): The knowledge engineering group at UEP is recognised for its research and educational activities in knowledge discovery from databases and in knowledge-based systems. It recently participated as funded partner in two IST projects in the KDD area, one IST project in medical informatics area, and one eContent project. Co-ordinator of several projects funded by the Czech Science Foundation. Member of multiple network projects such as KDnet , Ontoweb or EUNITE.

Background work will be in the area of combining tabular data mining with knowledge extraction from text, and in tracking the context of multimedia handling.

B.5.2 New participants

The consortium has been carefully built according to the required complementarity and the critical mass needed to achieve all the proposed activities. Currently, there are no unidentified partners. However, the management structure of K-Space is flexible enough to accommodate additional partners if it is considered convenient by the consortium in the future. In this case new partners will be selected according to their technical expertise and demonstrated potential for further integration. Additionally, K-Space will make several other European research institutions aware of its activities and will pursue cooperation at different levels. For this, the dissemination activities and specifically membership of the envisaged scientific forum in cross and multimedia will be instrumental.

B.5.3 Other countries

The 14 members of K-Space are based in 9 different European countries, 8 of them current members of the EU and Switzerland which has an RTD cooperation agreement with the EU. Although, wide cooperation with non European institutions will be targeted, specifically with leading institutions in the USA, Japan and Korea, the structural organization and decision making will remain as appear in this proposal and the consortium agreement.

B.6 Quality of the integration

K-Space JPAs are designed to integrate basic research in semantic web technologies, multimedia processing, information retrieval, resource management in heterogeneous networks, semantic inference, user modelling and interaction, with technological development by producing software platforms and open libraries that will be available to the cross and multimedia scientific forum, thereby achieving vertical integration. Horizontal integration is achieved by integrating, for a purpose, what can be disparate disciplines including image processing, information retrieval, human computer interaction and industrial and private users groups. The productivity of the integration activities and inclusion of the wider community is achieved through joint training schemes, joint workshops and joint education tools and courses, as well as access to much of the resources such as platforms and data.

The particular nature of knowledge-based multimedia analysis and multi-media research demands integration of techniques from various disciplines and the K-Space JPA is designed to achieve the required degree of integration. Additionally, the envisioned research can only proceed if these activities are shared; no single site is large enough to support this kind of infrastructure. Also, while small number of student exchanges take place already, this is difficult and inefficient because of the lack of shared tools and data. Lack of common teaching resources also makes the joint training and dissemination activities difficult. Both are addressed in the work plan. The work plan also, as explained below, ensures that the communication infrastructure and early tutorial and seminar information exchange is established early in the project.

B.6.1 Activities Contributing to Quality of the Integration

The JPA proposed by the K-Space consortium incorporates a considerable number of actions that should achieve a high degree of integration not only between the different partners of this NoE but also within the researchers in the whole research community working on the research topics addressed. As a consequence of the strong belief all partners have in the value of K-Space and their enthusiasm for participation in K-Space (through the mutual benefits each one will be able to acquire through the collaboration they will be engaged in during the lifetime of the NoE) they all have a commitment for establishing a deep and durable integration during and beyond the 4-year budgeted period of the Commission.

The K-Space consortium believes that technology transfer is one of the driving factors that will effectively contribute to the continuity of the network is the aspect of technology transfer. This will be prepared during the NoE funded period, in terms of teaching material including books, CD-ROMs with text, audio tracks and video clips, tutorials and reports published on the K-Space Website. This material will provide a thorough coverage of all scientific and technological results of K-Space and will endure and be used beyond the NoE budgeted lifetime.

Appropriate links with industry, including SMEs that are involved in the multimedia content value chain, with academic institutions or other NoE's will be sought. Provision of consultancy services and transfer of technology to SME's is one of the objectives of K-Space as well as intentions for setting up spin-off companies to develop products using technologies and research findings produced by K-Space.

The workplan shows many areas of close cooperation. For example WP3 builds a reference architecture that will be used throughout the project as glue to help ensure the components developed through the joint action can communicate and interact in an agreed manner. WP4, WP5 and WP6 build joint interoperable component libraries, with contributions from all participants, for many functions in the cross and multimedia delivery chain. The activities in WP3 monitor and manage all key integration activities. Each of the activities in WP2 will be reported regularly, throughout the funded lifespan of the NoE. Specifically, they include the monitoring and management of the exchange of academic research personnel, industrial placement of research personnel, sharing research test data, sharing teaching resources, creation of joint research environments and integration evaluation

It is important that the project sets up communications infrastructure early, so as to establish and support the integration. For this reason the detailed work plan in B8 shows that during month 3, the web portal will be finalized. A website will be established at the start of the project but by month 3 this will have a fully functional information retrieval system embedded within. This will enable users to exchange research (software libraries, algorithms, etc), data (images, audio, video, metadata and text) and publications (tutorials, journal and conference papers, etc). Discussion/work-group areas will be supported and information on how to use such facilities will be disseminated to NoE members and beyond. Arguable for

such a research area such information is redundant, but we want to draw in a wide community, and easy access to help people with diverse skills to use the communications technology is not a waste of resource.

Progress in setting up the communications infrastructure will be closely monitored. By the end of month 3, the entire communications infrastructure necessary for K-Space-related research should be firmly established. Whether the requirements have been fulfilled can be checked simply by asking whether all researchers have the ability to share information with each other in a timely and efficient manner, and whether all important information is recorded and documented. Should that not be the case, it is easy to determine which steps have been omitted. For instance, if a researcher has a large unused test bed of video files, then those files should be integrated into the file server and made visible through the website. Similarly, if an industry is unaware of some aspects of K-Space research, then those aspects should be promoted and advertised via the newsletter and mailing lists. The first month of K-Space are mostly confined to setting up the necessary infrastructure. The relevant work groups will set up mailing lists, points of contacts, file servers, news groups, web servers, and any other tools necessary to support communication. This will be organised primarily in WP6, and involves all the research groups.

In order to draw members into the NoE it is also important that other forms of information exchange, through news letters, and better, through seminars and tutorials start early. Month 4 should see the release of the second newsletter, and the beginning of the seminar series. These seminars will be recorded for later broadcast, and streamed for immediate broadcast. Month 2 will see the beginning of the tutorials based on expertise already developed. The development of knowledge-based multimedia analysis applications requires that a significant number of researchers have an understanding of how to work with multiple media types. The tutorials will explain, for example, what an audio expert should know about video, and what a video expert should know about audio. They will be recorded and available to all researchers. New tutorials can be submitted at any time, and they will be sorted and organised as they are received. For those subject areas which have not been covered, tutorials will be solicited by experts. The tutorials will also cover the formats for manipulation of metadata, such as XML and MPEG-7.

As soon as month 3 an industry forum will be established. This will facilitate technology transfer. The industry forum will permit a clear and sustainable feedback from industry and a better mutual understanding between the academic and the industrial worlds. Prior to the establishment, a list of goals will be provided by the researchers. This will be critiqued by K-Space Industrial Advisory Board. In turn, the Industrial Advisory Board will provide feedback and suggestions regarding their interests and the directions which they would like to see pursued.

It is one thing having a plan to support integration, which K-Space certainly has, but what makes integration really work are satisfactory mechanisms to monitor progress, take corrective action in a timely fashion and follow through to make sure that the actions have had the desired effect.. The K-Space management structure has borne this in mind Unsatisfactory progress will be addressed by the Quality assurance Team and the Network Executive Committee as explained in the next section and B8. Remedial action will be taken as appropriate. The activity 1.6 in WP1 is responsible for gathering evidence of the success (or otherwise) of integration activities and feeding this back to the network Scientific Advisory Board for evaluation. It monitors continually, and reports at regular periods during the project, viz. Report on integration activities, according to several Milestones given in the project time plan. The nature of the action depends on the degree and significance of the slippage. The structure of the NoE is such that the Committee has the authority to do so.

We are acutely aware of the risks that may cause a Network of Excellence to fail in its objectives. Such a complicated programme is wrought with pitfalls, all of which must be accounted for. The risks fall into two broad categories: organisational difficulties and technical difficulties. A detailed description of all identified risks and threats along with the provisions to deal with them is given in section B8.2.

B.6.2 Qualitative and Quantitative Indicators

Researchers are increasingly aware of the benefits of integrated networks as a means of synergistic cooperation. The domain of K-Space is naturally suited to collaborative research as innovative and potentially deployable developments depend on the synthesis of ideas from assorted scientific and technological areas in order to provide a consistent and efficient solution. K-Space researchers are extremely motivated to these issues and are committed to this purpose.

The activities in K-Space to support these statements are primarily

- Those related to the setting up of joint work on coherent architectures for the supply chain, resource management and delivery, demonstrations using simulations and laboratory test-beds of heterogeneous networks where the techniques and applications developed within the framework of this NoE will be tested. Also the key theme pervading many workpackages of Quality of Experience will be used to give focus to user centric demands, services and their provisioning.
- Training and other forms of dissemination of excellence. Partners will collaborate to produce accessible high-quality material, in the form of books, training material and articles to be published in scientific journals and conferences
- Active contributions to developing standards, e.g. Motion Picture Experts Group (MPEG), Joint Photographic Experts Group (JPEG), International, Telecommunication Union (ITU), Society of Motion Picture and Television Engineers (SMPTE), Internet Engineering Task Force (IETF), 3rd Generation Partnership Project (3GPP), Open Mobile Alliance (OMA), European Telecommunications Standards Institute (ETSI), Language resources management (ISO TC 37/TC4) and the Java Community Process (JCP).

The following set of qualitative and quantitative indicators can be used to provide an indication of the performance of K-Space. The K-Space committee will look at these indicators regularly to assess the degree of integration and use them to guide its management decisions.

Table 4 Qualitative and quantitative indicators that will be used to provide an indication of the performance of K-Space

Activity Type	Quantitative indicators	Qualitative indicators
Integration activities	• Degree of use of shared databases containing source material, testing procedures, results, working tools and documentation and the extent to which the use of and provision to this databases are shared by all partners; • Development and degree of use of common platforms and test-beds and their use by a variety of partners • Setting up test environments and cross validation of techniques and the results of different partners • Number of common resources • Usage of common resources	• Sharing of resources such as research tools, lab facilities, network simulators and test-beds, visualisation equipment; • Accessibility to the shared tools and platforms • Standardisation of K-Space • technology, • Wide acceptance of existing and proposed standards • Release of deliverables on time; • Meeting the proposed milestones
Training and Mobility	• Number of K-Space students attending and receiving the K-Space linked European Master Programs • Number of K-Space researchers involved in K-Space linked graduate and post graduate programs • Number of K-Space researchers involved in short visits/exchanges • Number of joint summer schools /workshops/seminars and short tutorials aimed at creating awareness of the K-Space research outcomes • Number of participants in public workshops aimed at the possibilities of the combined use and deployment of K-Space related technology;	• K-Space sponsored graduate and postgraduate programs are widely recognized • Links and support (if possible) to underdeveloped countries, particularly in Europe

Dissemination and Spreading of Excellence	• Number of special issues • Number of contributions to K-Space conference • Number of participants in K-Space conference • Number of daily visits to the K-Space Website • Number of Web seminars broadcasted • Number of participants in Web seminars • Number of industry short courses • Number of independent and joint contributions to standardisation bodies; • Regular Joint progress reports or scientific manuscripts produced by participants active in several research areas; • Publication of scientific articles in all the research areas of K-Space;	• K-Space is recognized as a European Forum in cross media • Established links with external • forums and industry • Numbers of K-Space, non- K-Space, industrial, non-European participants in K-Space conference • Provision of consultancy services by K-Space members and technology transfer to SME's.

B.7 Organisation and management

The management structure of the Network consists of three main hierarchical layers: Management Centre, Network Steering Board and Technical Management Committee.

The Management Centre embraces the coordination office and the Administration Office. It is headed by the project coordinator, who is in charge of the overall network coordination and the communication with the European Commission officers. The Administration Office is the Network secretariat and management support. The Management Centre will have project monitoring and control powers to make sure that the project achieves the stated objectives and it takes place in accordance with the consortium agreements, and EU's legal and procedural requirements.

The Network Steering Board consists of five senior members of the network from five different institutions: The project coordinator, the integration and excellence spreading executive and three executives representing the Joint Research Activities of the Network. The project coordinator is the chair of the Network Steering Board and will be designed by the coordinator partner. Important issues like financial planning and updated JPA will be decided upon the Network Steering Board on a regular basis. Aiming to strike the right balance between representation and efficiency the day-to-day decision making is undertaken by the Administration Office on behalf of the general assembly represented by the Network Steering Board.

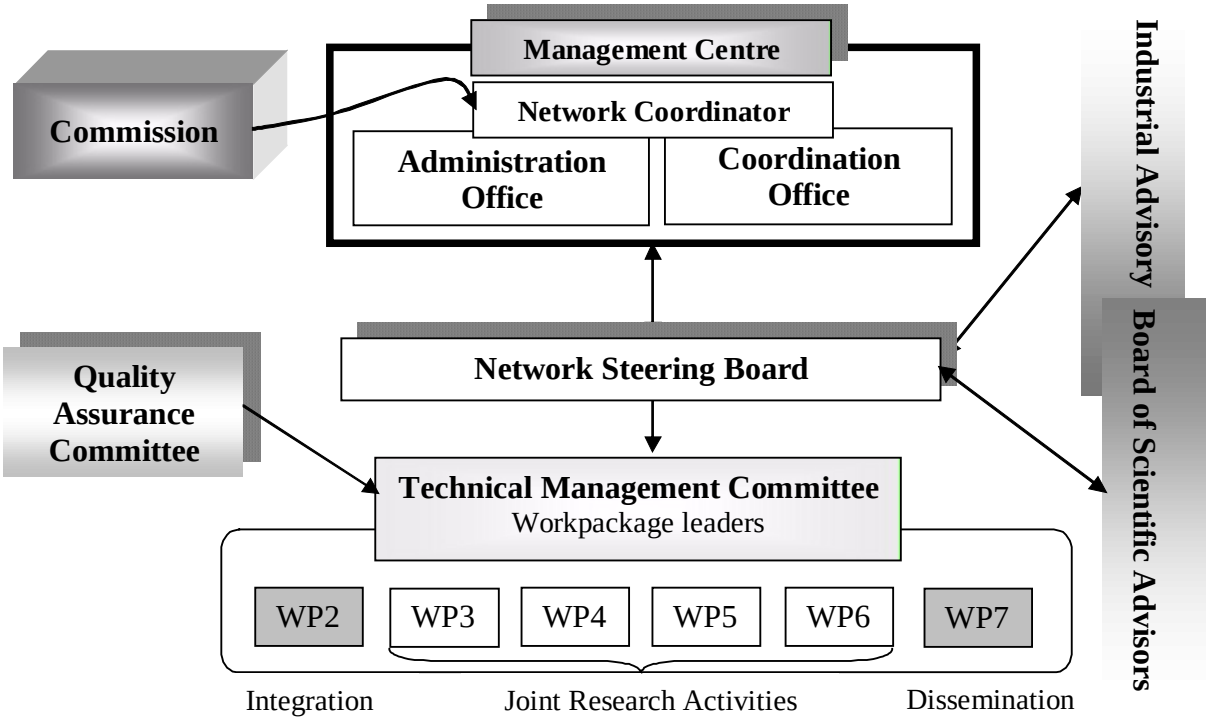


Figure 3 Overview of K-Space management structure

The Technical Management Committee consists of the seven workpackage leaders. Its mission is to coordinate the technical workpackage teams and steer the technical direction of the Network according to their own technical judgment and the advice given by other internal and external bodies attached to the Network. The workpackage teams are formed according to the work packages defined in the JPA. Their members are therefore the researchers and PhD students allocated to every non managerial WP. The chair of each workpackage team is naturally the WP leader or WP coordinator. Their main responsibility is to ensure that activities are carried out according to plan, milestones are achieved on time and deliverables are produced to an appropriate quality, in a time scale and at a cost acceptable to the respective Executive.

In addition to these three hierarchical management bodies, three other important Network Boards will provide advice and ensure that high quality standards are addressed in all aspects and activities of K-Space: the Industrial Advisory Board, the Board of Scientific Advisors and the Quality Assurance Committee. An overview of the K-Space management structure and the position of the different management committees with respect to each other and the commission officers is shown in Fig. 3.

The above outlined Management Structure has been designed to secure efficiency without compromising quality and representation. As it is schematically shown in Fig. 3, this structure is both hierarchical and democratic. It was cumulatively developed from several discussions involving most K-Space partners during the project preparation stages. Subsequently, general consensus on the following guidelines related to the management structure were agreed by all network members:

- There should be a small steering group of network members to drive the project forward
- The size of the Network Steering Board should not be so large as to compromise efficiency
- All main activity clusters should be represented in the decision making of the Network Steering Board
- The creation of sub-committees is encouraged on a dynamic basis according to the temporary relevance of specific activities
- The creation of sub-committees is delegated to the Workpackage leaders
- Quality assurance should be applied to sub-activities with the same nature and vigour as that to be applied to main Network activities and WPs.

These principles led to the development of the management structure of K-Space as shown in Figure 3. The structure is centralised because the five core partners forming the Network Steering Board will guide the strategic decision making and the overall coordination of the project on a day-to-day basis. The structure is democratic because the mission of the Network Steering Board is to represent the general assembly with all Network members. The above outlined principles are also stated in the Consortium Agreement.

B.7.1 K-Space Management Centre (KMC)

The KMC is the managing body of the network. Its main responsibility is the operational direction of the NoE. It has the decision making powers bounded by the guidelines, the JPA and the budget approved by The Network Steering Board. The KMC consists of the coordination office and the Administration Office. It is headed by the project coordinator, who is in charge of the overall network coordination and the communication with the European Commission officers. The KMC will ensure that the joint programme of activities is executed as planed. Since the network activities are well defined by work packages in the JPA, the task of the KMC will be to coordinate these efforts by working with WP leaders and to share relevant information with the Network Steering Board.

The Network Coordinator

The Network coordinator ensures that there is sufficient communication between the executives to successfully coordinate the whole network efforts. The coordinator will call and conduct meetings and form the link between the Network Steering Board and the other management boards, specially the Industrial Advisory Board and the Board of Scientific Advisors. The coordinator is responsible for:

- Communicate with EC
- Coordinate executive board activities and liaise with fellow board members
- Perform overall quality assurance checks by using the predefined qualitative and quantitative indicators of section B.6, and conduct quality inspections -then take necessary actions as part of the contingency plan presented in B.6.
- Prepare project planning and pass it to the administrative executive to draft it before it is passed to the Network Steering Board for approval
- Allocate founds according to the JPA and budget distribution approved by the NEC.

The Administration Office

It is the administrative hand of the lead partner organization. It is responsible for providing day-to-day secretariat, data/information gathering, document management, record keeping and communication structure of the consortium. The project office is also a decision and legal support system mainly for the Network Steering Board and the Technical Management Committee. It also provides basic-level support and information to all members of the NoE. The Administration Office is headed by the Administration Executive, who is a professional full-time manager dedicated to the day-to-day network management. The Administration Office will facilitate the day-to-day monitoring and dissemination of schedules, as well as introducing coherence in consortium activities. It will organize the meetings of the Network Steering Board, the Technical Management Committee and the general assembly. It will organize voice conferences and will administer the project communication system. The Administration Office will support the coordinating organisation with the financial management of the project. The Administration Office will also contribute to sustain the integration of the network, validation and dissemination of results. The additional role of the

Administration Office is to support the knowledge-in-use task, in order to extend the project quality control to knowledge acquisition in aid of promoting good practice. Important functions of the Administration Office include:

Legal management: It will maintain a consistent legal framework within the NoE such that corrective actions against defaulting partners, and resolution of conflicts between partners, are carried out in a fair, reasonable, timely, and low complexity manner.

Communication: An important function of the Administration Office is to ensure that the NoE members communicate appropriately and that important information is shared between partners and the management committees. It ensures that reporting to the European Commission officers is carried out in a correct and timely way. Regular reports as required by the rules of FP6 will be written and sent to the EC on time. This task will be performed jointly with the Project Coordinator who is the person that will communicate with the Commission officers. The Administration Office will also prepare the annual technical reviews, with the collaboration and effort of the Technical Management Committee. It will coordinate the writing of ongoing 18 month plans so that they are available for review at the end of each 12 month period.

Summary of management roles and functions of the Administration Office:

Key responsibility: Provide day-to-day secretariat, data-information gathering, document management, record keeping, communication and legal support to the NoE

Other responsibilities:

- Provide basic-level support and information to all members of the NoE
- Facilitate the day-to-day monitoring and dissemination of schedules
- Organize face-to-face and voice conference meetings of the NSB, the TMC and the general assembly
- Administer the Project Communication System
- Provide the financial management of the project
- Implement and monitor network auditing systems, including financial auditing and accounting
- Draft project plans and pass on to Network Steering Board for approval
- Prepare regular reports for the Commission and the Network Steering Board
- Prepare project, stage and exception plans in collaboration with other executive board members
- Enforce gender policies

The Administration Executive

The Administration Executive is the head of the Administration Office. He/she is responsible for all the actual running of the NoE activities on a day-to-day basis on behalf of the Network Steering Board. Every consortium partner will assign one staff member to answer all administrative requests. The writing of the annual report as requested by the Commission will be coordinated by this executive member to ensure that deadlines and integration quality standards are met. Working with the other executives, the administration executive will oversee that network policies on gender and social issues are being implemented. Finally, the financial and accounting procedures as required by the consortium contract and the Commission regulations will be implemented by the administration executive.

B.7.2 Network Steering Board (NSB)

It consists of five senior members of the network from five different institutions: The project coordinator, the integration and excellence spreading executive and three executives representing the Joint Research Activities of the Network. The project coordinator is the chair of the NSB and will be designed by the coordinator partner. The NSB is the decision-making body Vis a Vis the broad objectives of the project. It will ensure that decision-making in the network is done democratically. Every member of the NSB has one vote. Decisions are made with simple majority voting. Principal issues like financial planning and the annually updated joint programme of activities (JPA) will be decided upon by this body. The NSB is also responsible for the production of guidelines for the JPA, which has to be updated for the EU Commission every 12 months. These guidelines are binding for the work of the Network. For the production of these guidelines, the NSB will consult the Industrial Advisory Board and the Board of Scientific Advisors. The NSB is also concerned with the following issues related to the strategic vision of the network:

Addition of participants: With time, it may be necessary to admit new participants to K-Space. These will be identified by the NSB. The NSB may invite new participants to join in the network by releasing calls for participation according to the description in section B 5.2.

Disputes within the network: The consortium agreement (CA) signed by every partner is binding. Should disputes arise amongst network partners concerning an issue which is not treated in the CA, then the NSB will appoint an ad-hoc committee, made of independent technical and legal experts from both inside and outside K-Space, to deal with the conflict and seek a sensible solution. The committee's task will be to identify the reason of the conflict by holding separate meetings with the disputing parties, report findings to the NSB and seek a pleasant solution. If tension is not defused and origin of crisis persists, the NSB will vote on how best the conflict would be resolved through democratic means.

Summary of roles and functions of the Network Steering Board:

Key responsibility: Strategic direction of the Network
Other responsibilities:

- Ensure that this is a coherent project organization structure and logical sets of plans
- Monitor and control the NoE at a strategic level, especially reviewing progress against milestones
- Ensure the changes of scope, timescales, costs are in line with NoE objectives
- Keep the network in line with the expectations of the EU commission
- Provide guidelines for network activities and approval of JPA Budget distribution

K-Space Steering Board Officials

The research executives: There will be three research executives. They oversee the work done in the Joint Research Activities and ensure that progress is made towards completing the objectives and achieving the deliverables. They monitor the progress of WP's and perform regular technical audits to ensure that quality standards are met and deliverables are produced at specified deadlines. The research executives will report the outcome of his quality inspections to the chair. As a result of these coordination efforts, the research executives will be in a position to set up and maintain a knowledge database for management purposes.

The integration and excellence spreading executive: The integration and excellence spreading executive represents WP2 and WP7. He/she will ensure all dissemination activities goals are met according to plan. This executive will also oversee the work and progress of the integration activities and will be responsible for the results. This executive will coordinate convergence efforts and optimize resources when targeting important multidisciplinary research aspects by finding links between all K-Space research activities. Additionally, the integration executive will coordinate liaison and cooperative work with leading research institutions world wide. The integration executive is also responsible for assessing the quality of integration of K-Space and report findings to the chair.

B.7.3 Technical Management Committee

This committee is built by the seven WP leaders. Its mission is to coordinate the technical WP teams and steer the technical direction of the Network according to their own technical judgment and the advice given by other internal and external bodies attached to the Network. The WP Teams consist of the six WP dealing with non managerial activities (WP2-WP7). They are formed according to the work packages defined in the JPA. Their members are therefore the researchers and PhD students allocated to every non managerial WP. The chair of each WPT is naturally the WP leader. Their main responsibility is to ensure that activities are carried out according to plan, milestones are achieved on time and deliverables are produced to an appropriate quality, in a time scale and at a cost acceptable to the respective Executive.

Summary of roles and functions of the Technical Management Committee:

Key responsibility: Ensure that WP activities are carried out according to the time plan
Other responsibilities:

- Prepare plans for the different jointly activities and agree those with the NSB
- Receive authorization from the NSB to act and create products
- Direct, motivate, plan and monitor the WP-team's work
- Take responsibility for the WP-team's progress and take corrective action where necessary
- Advise administrative executive and respective NoE executive of any changes with the NoE plan
- Liaise with the Quality Assurance Committee

B.7.4 Industrial Advisory Board

This is as a crucial body, external to the Network core members, but yet strongly linked to all research, development, integration and excellence spreading activities of the project. The mission of this Board is to

ensure that the output of the targeted research becomes the primary feeding ground for industrially innovation. The Industrial Advisory Board with a core of four key industrial players has been already set and is being consulted from the very outset of proposal building. The current members of the board are: Motorola (chairing the board), Deutsche Welle, British Telecommunications PLC and Telefonica I+D.

The Industrial Advisory Board will be expanded and become a key component of the network, if the project is funded. This Board will give advice that help with the strategic positioning of the network activities with respect to commercial trends. Thus, a main objective of the Industrial Advisory Board is to enable speedy and sustainable feedback from industry and a better mutual understanding between the academic and the industrial communities involved in fields related to K-Space. As soon as in month two the first jointly meeting between the core Industrial Advisory Board and the Network Steering Board is planned. The aim of this initial meeting is to discuss industrial expectations and set up a preliminary plan for technology transfer. Prior to the meeting, a list of technical objectives will be provided by the Network members. These objectives will be assessed by the Industrial Advisory Board and used as basis for feedback regarding their interests and the research directions with the greatest commercial potential.

B.7.5 Board of Scientific Advisors

To avoid the possibility that K-Space might drift from its objectives of high quality technical outputs, integration, dissemination and lasting impact by having an inward looking focus, the Network will set up an independent Scientific Board comprising experts who are not core members of K-Space. The Board of Scientific advisor will also include core members of the Industrial Advisory Board. The Scientific Board will be asked periodically to review technical progress such that K-Space remains innovative, forward looking, and ensures that it is producing work of high technical quality. Over the lifetime of K-Space, the Network Steering Board will select one deliverable from each activity to undergo a peer review such that technical quality of the deliverables are verified. The Scientific Board may choose to review the deliverable themselves or may ask an independent reviewer to do so. Suitable honoraria will be paid to reviewers to enable them to carry out this task.

B.7.6 Quality Assurance Committee (QAC)

This Committee is formed of quality assurance experts members of the Network whose main responsibility is to ensure that QA is addressed in all activities of K-Space. The team will conduct regular and constant reassessment of the progress of K-Space activities and ensures that the network is being compliant with EU objectives by adhering to formal QA standards. The QAC is responsible for: working closely with Executive board chair on Quality assurance issues; Risk management procedures; Constant reassessment of value-added issues; NoE compliance with EU objectives; Ensuring the network remains viable in terms of cost, deliverables and time scales; Ensuring that applicable standards are being used and that any legislative constraints are being observed, e.g. equal opportunities, gender equality etc; Ensuring that the needs for specialist interests are being observed, e.g., accessibility and other ethical issues.

B.7.7 Consortium Agreement

To ensure a speedy and smooth start to the project if funding is granted, K-Space partners have already started discussing the contents of the Consortium Agreement. The Consortium Agreement will be finalised and signed before the signature of the contract, if K-Space is funded. Important issues which will be specified in the Consortium Agreement include (but are not limited to):

- Handling of confidential information within the consortium and definitions of usage of software within the K-Space project.
- Procedures for dealing with defaulting partners such as with-holding of payment to partners who persistently do not meet their progress and deliverable goals, transfer of resources between partners if required to achieve an activity.
- Settlement of disputes which cannot be agreed within the Network Steering Board.
- Duties of Network Steering Board and other Network members and procedures for calling and reporting of Network Steering Board, Technical Management Committee and the general assembly meetings.

B.8 Joint Programme of Activities – first 18 months

The key to making K-Space a success is the proper integration of all of its various components. This can be achieved using a step-by-step approach on concurrent activities moving in parallel over different WPs. The steps need to follow a logical progression leading towards the milestones, but should not be too ambitious or too narrowly defined.

The first month of K-Space are mostly confined to setting up the necessary infrastructure. The relevant work groups will set up mailing lists, points of contacts, file servers, news groups, web servers, and any other tools necessary to support communication. This will be organised primarily in WP1, WP2 and WP3, and involves all the research groups. During the first month all the activity leaders will call for meetings involving activity participants in order to discuss the steps to follow and organize the first working groups according to the budget plan and overall activity plan approved by the Network Executive Committee during the K-Space kick-off meeting to be held during the first week of the project. A careful plan for transfer of researchers will be discussed and firstly the relevant transfers will be agreed, i.e., the specifics of who should travel where, will be ratified by the Network Steering Board. The first researcher exchanges will commence soon after the kick-off meeting and not later than month 3. The budget and activity plan will follow the recommendations of the WP leaders as described in the next subsection.

Relevant material, state-of-the-art analysis and background expertise already developed will be assembled by month 2. This falls into a multitude of different subjects. The development of knowledge-based multimedia analysis applications requires that a significant number of researchers have an understanding of how to work with multiple media types. For those subject areas which have not been covered, tutorials will be solicited by experts. At the end of this month, the first newsletter will be disseminated. It will provide background information on K-Space, information on the resources that have so far been made available, and a description of the upcoming work.

In month 3 a first meeting with representatives of the industry forum will be organized. This will facilitate technology transfer and ensure that practical industrial needs are considered in the JRAs of the NoE at the outset. The Industrial Advisory Board will permit a clear and sustainable feedback from industry and a better mutual understanding between the academic and the industrial worlds. Prior to the establishment, a list of goals will be provided by the researchers. This will be analysed by the Industrial Advisory Board. In turn, the Industrial Advisory Board will provide feedback and suggestions regarding their interests and the directions which they would like to see pursued. Also during month 3, the web portal will be finalized. A website will be established at K-Space's inception, and by month 3 this should have a fully functional information retrieval system embedded within. Thus, users will be able to have a first exchange of research and expertise, test data and relevant publications, e.g., tutorials, journal and conference papers.

Throughout this time frame, progress will be closely monitored. By the end of month 3, the entire communications infrastructure necessary for K-Space-related research should be firmly established. Whether the requirements have been fulfilled can be checked simply by asking whether all researchers have the ability to share information with each other in a timely and efficient manner, and whether all important information is recorded and documented. Should that not be the case, it is easy to determine which steps have been omitted. For instance, if a researcher has a large unused testbed of video files, then those files should be integrated into the file server and made visible through the website. Similarly, if industrial organizations are unaware of some aspects of K-Space research, then those aspects should be promoted and advertised via the newsletter and mailing lists. At this point, progress reports will be required on various projects including conducted and ongoing research exchanges.

Integration activities will be carried out by all members of the NoE within WP2 and WP6. Each activity will have a coordinating partner who will be responsible for ensuring the smooth running of the activity and timely production of deliverables and milestones. One specific activity within this WP2 will be devoted to periodically gathering evidence of the success (or otherwise) of the network's integration activities. This evidence will be delivered to the Network Steering Board, so that it can feed-back recommendations to shape the evolution of the network's activities.

The following is a detailed description of the activity plan for the first 18 months broken down by WPs. In this description the external deliverables are marked as ED, and internal as ID.

B.8.1 Integration activities – WP2

This workpackage is broken into the following activities:

- **WP2.1** (month 1-18) Exchange of Academic Research Personnel
- **WP2.2** (month 1-18) Industrial Placement of Research Personnel
- **WP2.3** (month 1-18) Shared Teaching Resources
- **WP2.4:** (month 6-18) Dissemination to the non specialist citizen
- **WP2.5** (month 1-18) Monitoring and Evaluation of Integration Activities

The first two activities, WP2.1 and WP2.2, are concerned with mobility of researchers. The following specific tasks will take place for both these activities in the first 18 months, coordinated by Prof. Keith Van Rijsbergen, University of Glasgow (WP2.1) and Dr. Vojtěch Svátek, University of Economics, Prague (WP2.2):

- **WP2.1.1** (month 1-18) Exchange of Researchers via Short-term Fellowships
- **WP2.1.2** (month 1-18) Exchange of PhD Students within Cooperative Research Projects
- **WP2.1.3** (month 1-18) Visiting Scientists
- **WP2.2.1** (month 1-18) Short-term Industrial Fellowships
- **WP2.2.2** (month 1-18) Take-up of PhD Students for Industrial Experience

WP2.1 and WP2.2 activities will continue for the entire lifetime of the Network. This work results in two deliverables in the first 18 months, updated on an annual basis thereafter.

ID2.1 (month 12)	Annual report on researcher mobility, (Glasgow University)
D2.1 (month 12)	Annual report on industry/academia researcher mobility, (University of Economics, Prague)

The milestones are:

M2.1 (month 3)	Specification of procedures for research exchange (incl. a description of the joint research programme where appropriate) and a specification of the reporting mechanism to be employed (incl. deadlines and format)
M2.2 (month 3)	First version of a web-site for online submission of both proposals and reports including automatic notification of outstanding reports to participants
M2.7 (month 18)	First collation of proposals and reports submitted (to be used as the basis for mobility deliverables)

The next activity, WP2.3, coordinated by Prof. Thomas Sikora, Technische Universität Berlin, deals with sharing teaching resources amongst network participants.Updated versions of these teaching resources will be produced every 18 months during the lifetime of the project. In the first 18 months, this activity results in one deliverable:

ID2.2 (month 18)	K-Space online teaching resources, (Technische Universität Berlin)

The next activity, WP2.4, coordinated by Werner Haas, Joanneum Research Forschungsgesellschaft mbH, will enable the non specialist citizen access to the outputs of the technology that is being developed. A first open day will be organized at month 12. A second one in a different country will be organized in month 18. Deliverables in this Activity will be linked directly to the outcomes of WP2.5 and reported within deliverable D2.2

The final activity, WP2.5, coordinated by Dr. Noel O'Connor, Dublin City University, deals with monitoring the integration activities taking place within the network and reporting on the success (or otherwise) of these. The work in this activity continues for the life-time of the project. It results in a single deliverable within the first 18 months, with annual updates thereafter:

D2.2 (month 12)	Report on integration activities, (Dublin City University)

B.8.2 Joint research activities on content-based multimedia analysis – WP3

The activities in this WP concentrate on the research of low- to mid-level content extraction techniques aiming to provide concise information for WP4 and WP5. One of the main tasks of WP3 will be to establish a state-of-the-art report for multimedia content analysis which will be made public. The report will also depict a research road-map for the rest of the project. The WP consists of the following activities:

- **WP3.1** (month 1-10) Content Structuring
- **WP3.2** (month 1-18) Moving 2D and 3D Object Segmentation and Indexing
- **WP3.3** (month 1-18) Audio-/Speech Processing and Text Analysis
- **WP3.4** (month 3-18) Content Description

Activity WP3.1 concentrates on techniques to structure content based on low-level features and multimodal analysis. The following specific sub-activities will take place in the first 18 months, coordinated by Werner Haas, Joanneum Research Forschungsgesellschaft mbH.

- **WP3.1.1** (month 1-4) Preparation of a State-of-the-art Report on Multimedia Content Structuring
- **WP3.1.2** (month 1-18) Research in multimedia content structuring

The report on multimedia content structuring will be part of the overall state-of-the-art report for WP5, and will therefore be updated in month 36. The research in multimedia content structuring will be partially steered by the state-of the art report and in collaboration with WP4 and WP6. In W3.1 activities will continue for the entire lifetime of the Network. This work results in two deliverables in the first 18 months, updated on an annual basis thereafter:

D3.1 (month 5)	State-of-the-art report in multimedia content analysis (content structuring part), (Joanneum Research Forschungsgesellschaft mbH)
ID3.4 (month 18)	Technical report on content structuring, (Joanneum Research Forschungs-gesellschaft mbH)

Techniques to segment and describe moving objects will be investigated in activity WP3.2. The following specific tasks will take place in the first 18 months, coordinated by Dr. Noel O'Connor, Dublin City University.

- **WP3.2.1** (month 1-4) Moving Object Segmentation
- **WP3.2.2** (month 1-18) Indexing of 3D Objects and Models Segmentation

The report on moving object segmentation will be part of the overall state-of-the-art report for WP3, and will therefore be updated in month 36. The research in moving object segmentation will be partially steered by the state-of the art report and in collaboration with WP4 and WP6. WP3.2 activities will continue for the entire lifetime of the Network. This work results in two deliverables in the first 18 months, updated on an annual basis thereafter:

ID3.1 (month 4)	State-of-the-art report in multimedia content analysis (moving object segmentation part), (Dublin City University)
ID3.5 (month 18)	Technical report on moving object segmentation, (Dublin City University)

Activity WP3.3 concentrates on techniques for audio and speech processing and text analysis, specifically extraction of audio properties and the associated text. It will be coordinated by Gaël Richard, Groupe des Ecoles des Télécommunications, and will consist of the following specific tasks:

- **WP3.3.1** (month 1-18) Audio/Speech Processing
- **WP3.3.2** (month 1-18) Text Analysis

The report on audio and speech processing will be part of the overall state-of-the-art report for WP3, and will therefore be updated in month 36. The research in extraction of audio properties and audio segmentation will be partially steered by the state-of the art report and in collaboration with WP4 and WP6. WP3.3 activities will continue for the entire lifetime of the Network. This work results in three deliverables in the first 18 months, updated on an annual basis thereafter:

ID3.2 (month 4) State-of-the-art report in multimedia content analysis (audio and speech processing part), (Groupe des Ecoles des Télécommunications)

ID3.3 (month 4) State-of-the-art report in multimedia content analysis (text analysis part), (German Research Centre for Artificial Intelligence)

ID3.6 (month 18) Technical report on audio and speech processing, (Groupe des Ecoles des Télécommunications)

Activity WP3.4 is concerned with content description, profile definition and infrastructure for content analysis and content descriptions. The following specific tasks will take place in the first 18 months, coordinated by Werner Haas, Joanneum Research Forschungsgesellschaft mbH.

- **WP3.4.1** (month 1-3) Gathering of Requirements for Content Analysis and Content Description Infrastructure
- **WP3.4.2** (month 3-5) Definition of Architecture for Content Analysis and Content Description Infrastructure
- **WP3.4.3** (month 5-10) Implementation of the Infrastructure and Integration with WP5
- **WP3.4.4** (month 10-18) Definition of Descriptors and Description Schemes
- **WP3.4.5** (month 10-18) Definition of Suitable Metadata Profiles for Multimedia Content Analysis, Search and Retrieval

The sub-activity WP3.4.2 will be based on already existing components at JRS in close cooperation with WP6. WP3.4.3 will implement the infrastructure, in coordination with the implementation work in WP6, with which it will be integrated. The sub-activity WP3.4.4 will define descriptors and description schemes according to the results of activities WP3.1-3. Both of sub-activities WP3.4.4 and WP3.4.5 will be conducted in close collaboration with WP7. WP3.4 activities will continue for the entire lifetime of the Network. This work results in on external deliverable in the first 18 months:

D3.2 (month 10) Interfaces for content analysis and content description infrastructure, (Joanneum Research Forschungsgesellschaft mbH)

B.8.3 Joint research activities on knowledge extraction – WP4

This workpackage consists of the following activities:

- **WP4.1** (month 1-18) Specification of a Multimedia Ontology Infrastructure
- **WP4.2** (month 1-18) Knowledge-assisted Multimedia Analysis
- **WP4.3** (month 1-18) Knowledge-assisted Multimedia Reasoning and Annotation
- **WP4.4** (month 1-18) Data Mining
- **WP4.5** (month 1-18) Intelligent User Relevance Feedback

Activity WP4.1 focuses on the development of a multimedia ontology infrastructure based on the knowledge representation infrastructure and language extensions developed within WP5. It is coordinated by Prof. Steffen Staab, Koblenz University, and is broken into the following sub-activities:

- **WP4.1.1** (month 1-18) Top-level Multimedia Content Ontology
- **WP4.1.2** (month 1-18) Low-level Visual Feature Ontology
- **WP4.1.3** (month 1-18) Prototype Knowledge Base

This work results in the following deliverables in the first 18 months:

D4.1 (month 10) Annotation/population tool, (Informatics and Telematics Institute)

Activity WP4.2 deals with the semantic object detection, exploiting the ontologies of WP4.1 and the content processing algorithms of WP3 in order to apply the most appropriate detection steps for the analysis process. It is broken into the following sub-activities, leaded by Dr. Yannis Avrithis, Informatics and Telematics Institute:

- **WP4.2.1** (month 1-12) Numerical to Symbolic Analysis

- **WP4.2.2** (month 8-18) Symbolic to Semantic Analysis

This work results in the following deliverables in the first 18 months:

ID4.1 (month 4) Report on state-of-the-art in knowledge assisted multimedia analysis, (Informatics and Telematics Institute)

Activity WP4.3 deals with the extraction of meaningful interpretation of high level events and automatic semantic annotation of multimedia content, in collaboration with numerical and symbolic analysis of WP6.2. It is broken into the following sub-activities, leaded by Dr. Yiannis Kompatsiaris, Informatics and Telematics Institute:

- **WP4.3.1** (month 1-18) Constraint Based Reasoning
- **WP4.3.2** (month 1-18) Rule Based Reasoning
- **WP4.3.3** (month 1-18) Content Annotation

This work results in the following deliverables in the first 18 months:

ID4.3 (month 4) Report on state-of-the-art in multimedia reasoning, (Institut National de l'Audiovisuel)

Techniques for multimedia data mining will be investigated in activity WP4.4. The following specific tasks will take place in the first 18 months, coordinated by Dr. Joemon Jose, University of Glasgow:

- **WP4.4.1** (month 1-4) Preparation of a state-of-the-art report on multimedia data mining
- **WP4.4.2** (month 1-18) Research in multimedia data mining

The report on multimedia data mining will be part of the overall state-of-the-art report for WP3, and will therefore be updated in month 36. The research in multimedia data mining will be partially steered by the state-of the art report and in collaboration with WP5 and WP6. WP4.4 activities will continue for the entire lifetime of the Network. This work results in two deliverables in the first 18 months, updated on an annual basis thereafter:

ID4.2 (month 4) Report on state-of-the-art in multimedia data mining, (University of Glasgow)

D4.2 (month 18) Technical report on knowledge extraction, (Informatics and Telematics Institute)

Activity WP4.5 aims at exploiting human-machine interaction to derive semantic information from past experience using relevance feed-back. Initial work will focus on binary classification problems using support vector machines. Given a piece of multimedia content, the user will input information on its relevance with respect to a predefined semantic concept. The machine will learn from this input and infer corresponding classes of content in further classification iteration. Other kernel based methods will be investigated and intermediate results will be use to reinforce automatic annotation extracted in other activities. The following specific tasks will take place in the first 18 months, coordinated by Dr. John Bigham, Queen Mary, University of London:

- **WP4.5.1** (month 1-4) Preparation of a state-of-the-art report on user relevance feedback for multimedia annotation and retrieval
- **WP4.5.2** (month 1-6) Initial implementation of a generic technique for user relevance feedback based on support vector machines
- **WP4.5.3** (month 3-12) Relevance feedback in a multimodal environment, research and development of preliminary algorithms
- **WP4.5.4** (month 9-18) Kernel optimization according to specific classification tasks and media analysis

The following deliverables will be issued during the first project phase:

ID4.4 (month 5) State-of-the-art report on user relevance feedback for multimedia annotation and retrieval, (Queen Mary, University of London)

D4.3 (month 18) Technical report on implemented techniques for user relevance feedback, (Queen Mary, University of London)

B.8.4 Joint research activities on semantic multimedia – WP5

The workpackage is broken into the following 5 activities:

- **WP5.1** (month1-18) Knowledge Representation for Multimedia
- **WP5.2** (month1-18) Reference Framework for Distributed Semantic Management of Multimedia Metadata
- **WP5.3** (month1-18) Semantics-based Interaction with Multimedia
- **WP5.4** (month1-18) Knowledge Extraction from Complementary Sources
- **WP5.5** (month18-26) Semantic Descriptions of Multimedia Context

The first two activities, WP5.1 and WP5.2, go hand in hand such that the definition of structures is followed by some immediate example implementation. In the first 18 months the following subtasks are thus concerned:

- **WP5.1.1** (month 1-18) Extension of RDF / OWL / SWRL for Representing Semantic Data
- **WP5.1.2** (month 13-18) Reasoning with Semantic Multimedia Metadata
- **WP5.2.1** (month 1-12) Storage of Metadata
- **WP5.2.2** (month 13-18) Efficient Distributed Querying of Metadata
- **WP5.2.3** (month 7-18) Individual Organization of Semantic Multimedia-Data
- **WP5.2.4** (month 7-18) Collaborative Organization of Semantic Multimedia-Data
- **WP5.2.5** (month 7-18) Integrated Framework Reference Description

Activity WP5.1 is overseen by Prof. Steffen Staab, Koblenz University, as well as the activity WP5.2. The subtask WP5.2.5 wraps up work of task 5.2 into a widely accessible description. This work on these two activities results in five deliverables in the first 18 months:

ID5.1 (month 9)	Extension of RDF / OWL /SWRL, (Koblenz University)
D5.1 (month 12)	Top Level Ontology, (Koblenz University)
D5.2 (month 12)	Metadata store, (University of Economics, Prague)
D5.4 (month 18)	Extension of RDF / OWL /SWRL – 2nd revision, (Joanneum Research Forschungsgesellschaft mbH)
ID5.3 (month 18)	Individual Organization Prototype, (Centrum voor Wiskunde en Informatica)

The next activity, WP5.3, deals with using and creating semantic metadata at the user interface level. The following specific tasks will take place for this activity in the first 18 months, coordinated by Prof. Lynda Hardman, Centrum voor Wiskunde en Informatica:

- **WP5.3.1** (month 1-15) Semantic Retrieval
- **WP5.3.2** (month 12-18) Semantics-based Presentation of Multimedia (continued thereafter)
- **WP5.3.3** (month 1-18) Manual and semi-automatic semantic annotation

WP5.3.1 offers the user the possibilities to query and browse for metadata and related content. WP5.3.2 adapts queried results and multimedia database content according to the semantic metadata and its user. WP5.3.3 extends the existing semantic multimedia metadata by explicit or implicit annotations. Two corresponding deliverables will be produced under the auspices of Thierry Declerck, German Research Centre for Artificial Intelligence:

D5.3 (month 15)	Semantic Retrieval, (German Research Centre for Artificial Intelligence)
ID5.2 (month 15)	Semantic Annotation – Version 1 – semi-automatic, (German Research Centre for Artificial Intelligence)

The activity WP5.4 is concerned about augmenting the semantic multimedia metadata basis. In the first 18 months, this task will be restricted to primary resources directly attached to multimedia data only. This task will be coordinated by Thierry Declerck, German Research Centre for Artificial Intelligence:

- **WP5.4.1** (month 1-18) Mining Primary Resources

It will produce one deliverable:

ID5.4 (month 18) Mining Primary Resources, (German Research Centre for Artificial Intelligence)

The final activity, WP5.5, will only start after the first 18 months and will also serve to iterate on, extend, and improve earlier work taking into account the context dimensions of multimedia.

B.8.5 K-Space Framework for the Integration of Software Tools – WP6

There are two activities in this workpackage, both of which run for the entire duration of the project:

- **WP6.1** (month 1-18) Distributed Research Environment Design and Implementation
- **WP6.2** (month 1-18) Research resource sharing

The first activity, WP6.1, focuses on designing and implementing the physical instantiation of the K-Space research environment that will be used as a tool to aid collaboration. It consists of intensive effort in the first 18 months of the project, with a gradual fall off in activity thereafter as the planed distributed framework becomes more stable, requiring only maintenance work. This activity will be co-ordinated by Dr. Noel O'Connor, Dublin City University. In the first 18 months, the time plan on the sub-activity level is as follows:

- **WP6.1.1** (month 1-4) Distributed Research Environment Requirements Specification
- **WP6.1.2** (month 5-10) Study and Selection of Suitable Network Communication Mechanisms
- **WP6.1.3** (month 5-10) Study and Selection of Suitable Media Database Management Tools
- **WP6.1.4** (month 5-10) Study and Selection of Suitable Machine Independent Interface Technologies
- **WP6.1.5** (month 11-18) Initial Instantiation of Distributed Framework

The objective in WP6.1.1 is to create the requirements for the distributed research environment by identifying the functionality that this environment should support in order to facilitate collaborative research. The summary of requirements will be given in the deliverable:

ID6.2 (month 4) Requirements for distributed research environment, (Dublin City University)

Given the requirements specified in WP6.1.1, the activities WP6.1.2-4 will carry out a review of the current state-of-the-art technologies for supporting collaborative work addressing issues such as network communication mechanisms for exchange of data and remote execution of software, remote access to media databases and software repositories and platform independent mechanisms for interfacing Graphical User Interfaces. In each case potential candidate state-of-the-art technologies will first be identified. Then a small subset in each category will be selected for trial usage. Trial usage will involve a small set of partners volunteering to act as a beta testers for specific functionalities using an early subset of the available research resources from WP6.2. Potential examples of functionalities to be tested include checking software in/out of the repository, remotely running analysis tools, exchange of analysis results, interfacing a local GUI with a remote content-based search engine. Based on these investigations and partner feedback on trial usage, technologies that fulfil the specified requirements will be selected for the initial implementation of the collaborative research environment.

The focus of this activity is not to research and develop new technologies for the functionalities envisaged for the distributed research environment. Rather, the objective is to use existing stable state-of-the-art technologies that are currently being used in a variety of novel and successful educational and economic web services. In choosing appropriate technology, particular emphasis will be placed on open source frameworks and tools, thereby ensuring the sustainability and accessibility of the developed environment. In this context, XML-based technologies, such as those recommended by the Web Services Activity of the W3C, shall be investigated for application/service communication. CVS will be used for effective management of the software repository, whilst distributed applications will be facilitated via Web Services (J2EE) or Enterprise Java Beans (EJB). JBoss, an open source, J2EE standards-compliant application server, will be used for the deployment of all web applications and distributed components. For thin interface clients, servlets/JSP technology will be used communicating via HTTP(s), whilst for fat clients a tiered architecture facilitating abstraction between the application/applet layer and the back-end services will be adopted. Communication with databases will be achieved using suitable JDBC/ODBC APIs.

D6.1 (month 10) Distributed research environment specification, (Dublin City University)

WP6.1.5 focuses on the implementation of the initial version of the distributed environment. It will employ the technologies identified in WP6.2.1-4 in order to populate the environment with resources incorporated from WP6.2.

D6.3 (month 18) First implementation of distributed research environment, (Dublin City University)

The second activity, **WP6.2**, focuses on reviewing the existing research resources available within the Network on an ongoing basis in order to collect these into (distributed) repositories that can be accessed via the distributed environment designed in WP6.1. It runs for the entire duration of the project. This will require the following sub-activities coordinated by Dr. Noel O'Connor, Dublin City University:

- **WP6.2.1** (month 1-3) Review of Existing and Planned Resources
- **WP6.2.2** (month 4-10) Collection and Organisation of Test Content Repository
- **WP6.2.3** (month 4-10) Collection and Organisation of Analysis Software Repository
- **WP6.2.4** (month 4-10) Identification of a Suite of Front End User Interfaces

WP6.2.1 focuses on identifying existing partners' resources that can be used in the first implementation of the distributed research environment. This will identity the existing systems, software tools and test data that already exist within the Network and that partners are committed to sharing. It will also identify the resources that will be developed within the first year of the Network based on planned collaborations in the other technical workpackages (WP4, WP5 and WP6). Of all identified resources, a subset will be chosen for integration into the initial implementation of the distributed research environment.

ID6.1 (month 3) Initial review of partners' research resources, (Dublin City University)

WP6.2.2, WP6.2.3 and WP6.2.4 each focus on building the repositories required to populate the distributed research environment with useful resources. Separate activities are planned for test content (WP6.2.2), software (WP6.2.3) and user interfaces (WP6.2.4). Each activity will address issues in sharing research resources, such as Intellectual Property and copyright considerations independently. These sub-activities do not just gather resources into one large repository that is unusable in any real manner, but rather will also involve wrapping the identified resources in the interfaces identified in WP6.1. As such, close communication will be required between each activity in WP6.2 and the corresponding sub-activity in WP6.1 on specification of interfacing technology. The outputs of each sub-activity feed into WP6.1.5 where they will form the core of the first implementation of the distributed research environment.

D6.2 (month 10) Contents and description of shared resource repositories, (Dublin City University)

After month 10, this entire activity repeats so that available resources within the Network are reviewed and collected into the environment on an ongoing basis.

B.8.6 Joint programme of activities to spread excellence – WP7

This workpackage consists of the following activities:

- **WP7.1** (month 1-18) Website and Electronic Newsletter
- **WP7.2** (month 1-18) K-Space Conference - The European Workshop on the Integration of Knowledge, Semantics and Digital Media Technology (EWIMT)
- **WP7.3** (month 1-18) Towards a Scientific Forum in Multimedia Knowledge Extraction and Analysis
- **WP7.4** (month 1-18) Joint publications
- **WP7.5** (month 1-18) Short Courses and Training Programs
- **WP7.6** (month 1-18) Exhibitions and Demonstrations
- **WP7.7** (month 1-18) Contribution to standards
- **WP7.8** (month 1-18) Technology Transfer

First activity, WP7.1, coordinated by Dr. Vojtěch Svátek, University of Economics, Prague, will be divided into these specific tasks:

- **WP7.1.1** (month 1-18) The K-Space Website
- **WP7.1.2** (month 1-18) Bimonthly Electronic Newsletter

The K-Space website will provide access to training materials, web seminars, conference and meetings information. It will be a first level of communication between members of the NoE and will also be an important, externally visible facet of K-Space. The work on the K-Space website will be divided into two periods, the first one is the development of a Web site, lasting throughout the first three months of the project; the second one will take care of maintaining and constantly updating the web site. The first two month of the second sub-activity, WP7.1.2, will consist of specification of the electronic newsletter: format, content, diffusion list preparation, etc. A first issue of the letter is planned for M2, so the later work on this sub-activity will be preparation and distribution in bimonthly cycles.

Deliverables:

D7.1 (month 2,4,..18) Bimonthly newsletter, (University of Economics, Prague)

D7.2 (month 3) Web portal, (University of Economics, Prague)

The second activity, WP7.2, is coordinated by Prof. Ebroul Izquierdo, Queen Mary, University of London. This activity will promote and support the flagship dissemination forum of the Network: The European Workshop on the Integration of Knowledge, Semantics and Digital Media Technology (EWIMT). The objective is to establish of a conference series on the research areas of the network. It will serve as platform for the presentation of research paper from network members and the wide research community. A permanent steering committee will be set aimed at maintaining high quality scientific standards in this activity. One important objective of this activity is to broaden participation to the point where it becomes the main Conference in the area. It is expected that the fourth version of this event becomes a main conference with wide participation. This resulting yearly conference will be one of the lasting achievements of K-Space.

D7.5.1 (month 12) Proceedings of the Third European Workshop on the Integration of Knowledge, Semantics and Digital Media Technology (EWIMT, November 2006), (K-Space Partner hosting EWIMT'06)

D7.5.2 (month 24) Proceedings of the Fourth European Conference on the Integration of Knowledge, Semantics and Digital Media Technology (EWIMT, November 2007), (K-Space Partner hosting EWIMT'07)

D7.5.3 (month 36) Proceedings of the Fifth European Workshop on the Integration of Knowledge, Semantics and Digital Media Technology (EWIMT, November 2008), (K-Space Partner hosting EWIMT'08)

The activity WP7.3, coordinated by Thierry Declerck, German Research Centre for Artificial Intelligence, aims to ensure the persistence of K-Space beyond EU funding. Initial discussion on the viability of a scientific forum in knowledge-based multimedia analysis will be reported by month 12:

ID7.2 (month 12) Report on the viability of a scientific forum in knowledge-based multimedia analysis, (GET)

The activity WP7.4, coordinated by Prof. Touradj Ebrahimi, Ecole Polytechnique Fédérale de Lausanne, will represent an essential mean to build a coherent and solid learning society. Joint publications will help to spread excellence outside the network and to enlarge the network audience. Joint publications will be tackled by two different means:

- **WP7.4.1** (month 1-18) Special Sessions in Relevant Conferences
- **WP7.4.2** (month 2-18) Special Issue in Leading Technical Journals

In WP7.4.1, identification of important international and well established conferences that are likely to accept a special session on K-Space topics will take place during the first three months of the project. Later activities include nomination of an organisation committee, selection of conferences and organisation of the special session (selection of technical committee, call for paper, reviewing process, financial support for students) Special sessions organised currently and being discusses include:

- IEEE-ICASSP, IEEE ICME (International Conference on Multimedia and Expo), EUSIPCO, International Semantic Web Conference (ISWC), European Semantic Web Symposium (ESWS), Association for Computational Linguistics (ACL), International Joint Conference on Artificial Intelligence (IJCAI).

In WP7.4.2, the tasks will include identification of a leading journal and selection of papers from the conference special session.

Deliverables:

ID7.1 (month 10) Report on special sessions in leading conferences, (University of Glasgow)

The activity **WP7.5**, coordinated by Dr. Joemon Jose, University of Glasgow, is split into 5 sub-activities.

- **WP7.5.1** (months 3-18) K-Space Tutorials
- **WP7.5.2** (months 3-18) Web seminars
- **WP7.5.3** (months 1-12) Summer school program
- **WP7.5.4** (months 3-18) Short courses for industry
- **WP7.5.5** (months 1-18) European Master/PhD program and short courses

The first sub-activity, WP7.5.1, will focus on creation of K-Space tutorials from the existing education material amongst the partners for the first tutorial. These materials will be placed on the K-Space Web site and might include video recordings of courses and audiovisual materials. Later efforts will concentrate on continuous enlarging of the catalogue of available K-Space tutorials. Also, update the previous tutorials. The sub-activity WP7.5.2 consists of creation, from filmed seminars given in an institution of K-Space, of the first K-Space Web seminar. This seminar will be available to the rest of the network, both by streaming the seminar live (web-casting) and making it available as a download. Later, it will perform continuous effort for enlarging the catalogue of available Web seminars. In WP7.5.3, a call for proposal for summer schools will be issued for the organisation of the joint event first summer school/annual colloquium. In WP7.5.4, creation of short courses for industry from existing education material amongst the partners will be undertaken. Later, continuous effort for enlarging the catalogue of available K-Space courses. Update of previous courses. These courses will provide attendees from industry with an exposure to the latest ideas and research results, and will be intensive, over 1 to 3 days. WP7.5.5 - First phase towards the harmonisation of high level education in Europe. This is a long term goal and will initially involve only a few of the partners. The first phase of the Master program will be planned for September 2006, in which there will be sharing of materials across institutions (for example using the K-Space Tutorials) but each will teach its own students locally from those common materials. First phase for a proposition of a European Ph.D. Program. In this first phase, different initiatives will be promoted including: the establishment of a co-supervision framework, the introduction of special distinctions such as the European Doctorate distinction for Ph.D. thesis defended in front of a truly international board of experts. Ultimately, these actions will lead to a much stronger integration of doctoral programs between the universities of the network.

Deliverables:

D7.3 (month 7) First K-Space tutorials, Web seminars and short courses for Industry, (Dublin City University)

D7.4 (month 7) First web seminar, (Groupe des Ecoles des Télécommunications)

D7.6 (month 12) First Yearly summer school, (University of Glasgow)

D7.7 (month 12) First Yearly report on the European integration of Master and doctoral programs, (Koblenz University)

D7.9 (month 14) First short course for industry, (Institut Eurécom)

The activity WP7.6, coordinated by Werner Haas, Joanneum Research Forschungs-gesellschaft mbH, will consist in having an identifiable presence at important international meetings and exhibitions, such as IBC (International Broadcasting Convention). Identification of important international meetings and exhibitions. Call of proposal for a K-Space stand at these exhibitions. Organisation, preparation of the K-Space stand at the identified major events

Activity WP7.7, coordinated by Prof. Thomas Sikora, Technishe Universität Berlin, this activity aims at actively participating and contributing to ongoing international standardization initiatives. Active participation to relevant initiatives such those of ISO/IEC JTC1/SC29 WG 11 (MPEG) and WG1 (JPEG) standard bodies. A number of new activities are started within MPEG that are of great interest for K-Space (MPEG-7 and -21, and Music Notation integration with MPEG). In the case of JPEG2000, the new work item JPSearch, aiming at standardizing technology for indexing, search and retrieval of still images, is well

aligned with the scope of K-Space. Other standards, like ones describing semantic web layer structure and ontologies are also of central interest for K-Space (Unicode, URI, XML/XML, RDF, RDFS, OWL,OWL Lite, OWL DL, OWL Full).

Deliverables:

D7.8 (month 12) First Yearly report on Standardisation contributions, (Technishe Universität Berlin)

Activity WP7.8, coordinated by Prof. Bernard Merialdo, Institut Eurécom, will aim at properly transferring technology to industry. To facilitate this transfer, a forum of industry will be established. The forum of industry will allow to provide the academic network participants with feedbacks from current trends in Industry (Market, user requirements …). Such a forum will permit a fruitful interaction between the academic partners of the networks and the industry and will thus facilitate technology transfer. All members of the forum will be invited to a yearly workshop and will be asked to suggest new directions/strategy to augment K-Space impact and integration effort.

Deliverables:

ID7.3 (month 14) Technology transfer initiatives and feedback from Industry, (Institut Eurécom)

B.8.7 Consortium management activities – WP1

B.8.7.1 Description of activities

As described in Section B.4., the management activities are designed to guarantee that the project runs smoothly by ensuring that the goals are clearly defined and understood. The proposed management structure of the Network will be functional immediately after the project kick-off meeting. The following management activities will be undertaken during the first 18 months (the timeplan for the achievement of these activities is given in the Gantt chart at the end of section B8.3):

- **WP1.1** Management Charter
- **WP1.2** Communication With the EU Commission
- **WP1.3** Financial Planning
- **WP1.4** Accounting and Financial Audits
- **WP1.5** Handling of Legal and Ethical Matters
- **WP1.6** Concertation, Consensus and Clusters
- **WP1.7** Overall Coordination of the Joint Activities of the Network
- **WP1.8** Quality Assurance and Technical Auditing
- **WP1.9** Gender and Social Issues

The formal and legal mechanisms required in the network are clearly specified in the Consortium Agreement. However, the task WP1.1 defines and sets up the practical mechanisms to implement the terms of the Consortium Agreement.

ID1.2 (month 3) Management charter, (Queen Mary, University of London)

In WP1.2, one staff member from each partner is appointed as administration contact to interface with the administration manager. This way, there is a clear communication interface between the commission and the NoE. For the production of the progress reports that will be ratified by the Network Executive Committee, the administration managers will rely on the expertise of the Network Executive Committee.

D1.1 (month 6, 12, 18) Regular management and progress reports, (Queen Mary, University of London)

In WP1.3, a detailed financial plan will be written by the administration executive, based on the outline financial plan of the project and the recommendations of the CO. This plan will be used to review the financial status of the project on a regular basis, and used to generate reports to the Network Executive Committee.

ID1.1 (month 1, 13) Yearly financial plan, (Queen Mary, University of London)

WP1.4 will ensure that financial audits as required by the EU are being implemented in the network. If needed the administration manager will use network funds for the auditing procedure. Based on the accounting figures, future budgets will be planned and overspending will be limited.

D1.2 (month 12) Financial audit reports, (Queen Mary, University of London)

The activity WP1.5 will cover the way that partners behave with respect to each other according to the terms of the Consortium Agreement. It will deal with the liability of partners, partner withdrawal procedures, the settlement of disputes, the responsibilities of partners regarding accurate and timely reporting of difficulties, confidentiality, including the difference between foreground and background information, IPR, including arrangements for licensing and special duties of the coordinating Partner.

In WP1.6; the Network is committed to the exchange of information and integration with other related projects in the framework of Clusters or other concertation mechanisms that might be established in order to achieve the overall project vision. This task will identify potential for clustering and use diverse project activities to perform concerted actions with other networks and projects. The results of these efforts will flow into the progress reports.

WP1.7 is the main activity and main task of the Network Executive Committee. The progress of individual actions and achievements in the corresponding activities will be supervised by the WP leaders who report to the Project Executive Committee. The Network coordinator (Chair of the NEC) will ensure that relevant information on NoE progress and status is being exchanged among the members of the Network Executive Committee. Using this information the Network Executive Committee can quickly identify if changes are needed and efficiently decide what corrections or new actions should be implemented. The results of these efforts will flow into the progress reports.

WP1.8; The Quality Assurance Committee will ensure that relevant technical activities are audited as required by the EU. All deliverables and internal action reports will undergo internal reviews. The outcome of the review and following discussions will be used to set new directions and corrections if required.

D1.3 (month 12) Reports on technical audits and internal reports, (Queen Mary, University of London)

WP1.9; The Administration Executive will use his/her close links to the administration contacts in order to ensure that gender and social issues policies are being implemented. Wherever difficulties arise, the Administration Executive will take necessary steps to make sure that partners conform to these network policies. If the need for further regulation is identified, the Network Executive Committee will delegate this decision to the Coordination Office.

D1.4 (month 14) Status report, (Queen Mary, University of London)

B.8.7.2 Risks and contingency planning

Organisational Issues: Of primary importance and significant likelihood amongst the possible organisational difficulties is the danger that the Network does not achieve proper integration. That is, the various elements become disparate and divergent rather than coalescing. Key to the success of K-Space is successful integration of all the various components. Careful monitoring of the progress of all the groups, providing many communications channels, and setting careful and well-planned deadlines are all part of ensuring that the Network does not splinter. Another major problem that the NoE might encounter is a lack of motivation. Research in certain areas can prove slow, and it is important that the progress of the NoE is not dependent on the success of any one work programme or on the ability to reach any milestone. That is, milestones should not be too closely coupled. A lack of clearly defined goals would result in the research being vague and slow. Again this is resolved by having well-defined and precise objectives. These goals will be re-evaluated as K-Space proceeds, so that they can be modified if over or under optimistic, and so that they can be clarified if ambiguous.

While not necessarily a risk, the research may drift from its original focus. Although there is a well-defined work programme, research may follow unexpected directions. This does not necessarily have a negative connotation, because it implies the possibility, that certain avenues of research have proven far more fruitful than expected. In which case, the work programmes will be modified to take this into account. However, the research will still be steered towards an integration of the various different work programmes and their subject areas.

The contingencies for each of these risks can be formulated as they arise. The three tier management structure of K-Space has been carefully designed to allow for status information to flow up from WPT to Network Steering Board to Network Executive Committee, to have the authority to make decisions and the flexibility to implement changes. There is a possibility that all the work done in the course of this NoE leads to very little further development. In effect, there is no advancement of the field because the work produced by the NoE is never pursued. An inability to popularise the research is one potential risk of an NoE. However, this is highly unlikely and steps have been taken to prevent this. First, the researchers have strong links to industry, and industry and business is heavily involved in this NoE. This serves to increase its exposure. Second, the NoE is heavily involved in the use of popular standards. Use of the standards is encouraged and promoted, and it ensures a level of interoperability with other projects. Third, the work is planned to be heavily promoted through conferences, journals, website, etc., and collaboration with interests outside the Network is encouraged. And finally, K-Space consists of research groups with international acclaim, and leaders in their respective fields, so the chance that their work is not recognised and pursued seems very doubtful.

A lack of leadership would result in K-Space failing the most difficult stages that require a strong level of collaboration between different research groups. For instance, knowledge-based multimedia analysis delivery with high QoS cannot be achieved without experts in all relevant media types working together in tandem with experts on retrieval systems and media delivery. This requires careful management and supervision. Most of this management is provided in work programme 1. In this programme, a method has been devised for overseeing all the various components. Furthermore, for each of the other work programmes, the appropriate leaders have been identified.

A lack of industrial input is another possibility. While the academic members of the Network certainly have a strong interest in publishing and disseminating their work, the industrial and commercial membership has a less clear benefit. However, the ties with industry are already quite strong, and the commercial benefits are obvious. The industrial members of the Network will be kept abreast of all developments and, since one goal of K-Space is the transfer of knowledge between academia and industry, all partners will have a vested interest in pursuing and promoting industrial input.

Gaps in the infrastructure of the K-Space Network might appear. These gaps could hinder integration, as well as presenting unforeseen technical difficulties. However, within this section, B8, the Gantt charts and Dependency diagrams indicate how each of the components fit together. Each area is well-covered, with a certain amount of overlap. Thus any gaps that might appear in turn have several research groups which could attack the problem from different perspectives. The agenda of each Network Steering Board meeting will include an item addressing the issue of gaps. WP-Team members can identify gaps in the WPs, if they arise, and inform the Network Steering Board.

One final organisation-related risk to mention is the possibility of an unverifiable end point, or the complete lack of a suitable end point. That is, one of the work programmes may lack a clearly defined goal. However, all the work programmes have definitive objectives and milestones. Each element of the Network has an associated endpoint. By the end of the 18 month period, prototype knowledge-based multimedia analysis delivery systems will have been constructed. This gives a well-defined endpoint that can be easily verified.

Technical Difficulties: Some of the possible issues relate to copyright, standardised formats and problems in extracting semantic meta-data from audiovisual media. K-Space aims to provide high quality knowledge-based multimedia analysis services for both public and private media. This is, of course a dichotomy which may be problematic for two reasons. First, copyrighted media may be shared and distributed by researchers, and enter the public/mainstream. Second, the public, uncopyrighted media may inadvertently include copyrighted media. Where possible, standards such as XML and MPEG-7 are intended to be used. This should simplify much of the work and ensure longevity and interoperability of components. However, these standards may prove insufficient for the needs of this project. This is doubtful however, because the intended standards are extensible and adaptable. Furthermore, we are not restricted to such standards. It will be an important achievement if we identify limitations in the standards that necessitate their revision or justify the

creation of improved formats. Of course a fundamental problem related to the extraction of meta-data from media. It might be very hard with no ready solutions.

However, this is an integration of research work and part of their expertise is to tackle difficult problems, while finessing the intractable. If the problem was easy there would be no need for the JRA.

B.8.8 Work planning showing the timing of JRA -Gantt charts

B.8.8.1 Gantt chart WP2

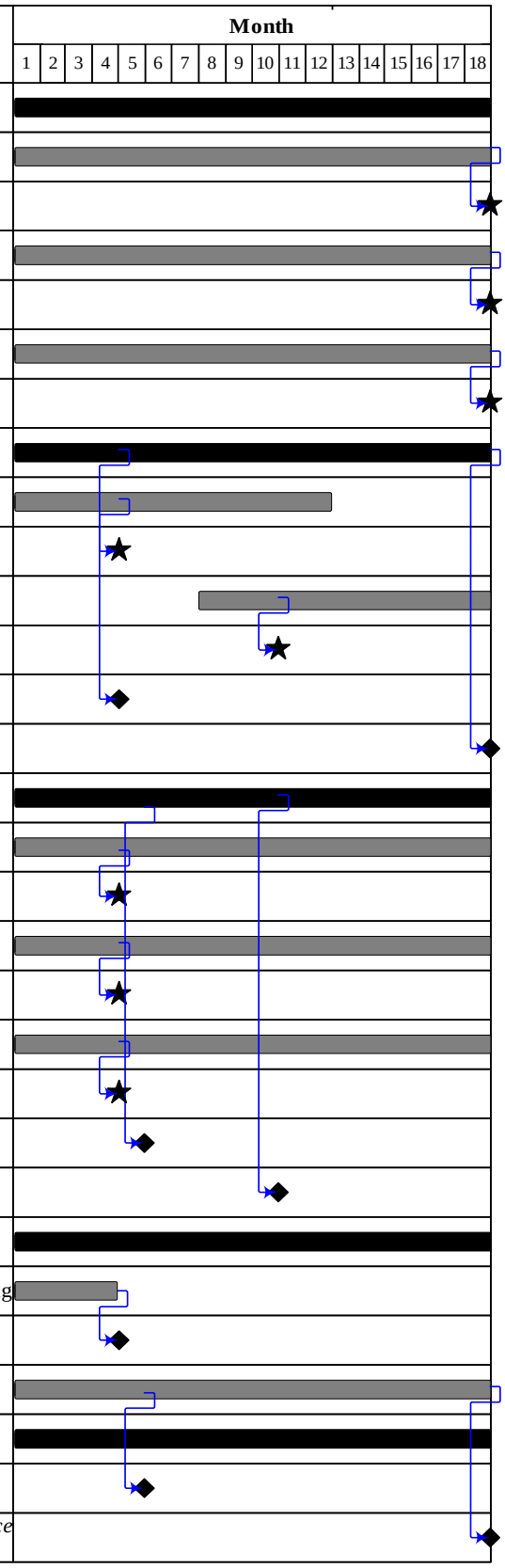
Task ID	Task Name	Month 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
WP2.1	**Exchange of academic research personnel**																		
D2.1	*Annual report on industry/academia researcher mobility*																		
ID2.1	*Annual report on researcher mobility*																		
WP2.1.1	Exchange of researchers via short-term fellowships																		
M2.1	*Specification of a format for proposals for each type of research*																		
WP2.1.2	Exchange of PhD students within cooperative research projects																		
M2.2	*First version of a web-site for online submission of both proposals and reports*																		
WP2.1.3	Visiting scientists																		
WP2.2	**Industrial placement of research personnel**																		
D2.2	*Report on integration activities*																		
ID2.2	*K-Space online teaching resources*																		
M2.7	*First collation of proposals and reports submitted*																		
WP2.2.1	Short-term industrial fellowships																		
WP2.2.2	Take-up of PhD students for industrial experience																		
WP2.3	**Shared teaching resources**																		
M2.3	*Survey of existing teaching resources available within the network*																		
M2.4	*Organisation of identified resources into coherent syllabi in preparation for Annual Colloquium*																		
M2.8	*An indexed and searchable web-version of the material presented at the Annual Colloquium*																		
WP2.4	**Dissemination to the Non Specialist Citizen**																		
WP2.5	**Monitoring and Evaluation of Integration Activities**																		
M2.5	*First reporting of all integration activities to NEC*																		
M2.6	*Collaborative review of WP1 deliverables due at month 12 by all network participants*																		
M2.9	*Formulation of recommendations on integration activities to Network Steering Board*																		
M2.10	*Formulation of recommendations on integration activities to NEC*																		

B.8.8.2 Gantt chart WP3

Task ID	Task Name	Month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
WP3.1	**Content Structuring**	
WP3.1.1	Preparation of a state-of-the-art report on multimedia content structuring	
D3.1	*State-of-the-art report in multimedia content analysis (content structuring part)*	
WP3.1.2	Research in multimedia content structuring	
ID3.4	*Technical report on content structuring*	
WP3.2	**Moving 2D and 3D Object Segmentation and Indexing**	
WP3.2.1	Moving Object Segmentation	
ID3.1	*State-of-the-art report in multimedia content analysis (moving object segmentation part)*	
WP3.2.2	Indexing of 3D Objects and Models Segmentation	
ID3.5	*Technical report on moving object segmentation*	
WP3.3	**Audio-/Speech Processing and Text Analysis**	
WP3.3.1	Audio/Speech Processing	
WP3.3.2	Text Analysis	
ID3.2	*State-of-the-art report in multimedia content analysis (audio and speech processing part)*	
ID3.3	*State-of-the-art report in multimedia content analysis (text analysis part)*	
ID3.6	*Technical report on audio and speech processing*	
WP3.4	Content Description	
WP3.4.1	Gathering of requirements for content analysis and content description infrastructure	
WP3.4.2	Definition of architecture for content analysis and content description infrastructure	
M3.1	*State-of-the-art report on multimedia content analysis and infrastructure definition*	
M3.2	*Architecture definition for content analysis and content description infrastructure*	
WP3.4.3	Implementation of the infrastructure and integration with WP3	
M3.3	*Content analysis and content description infrastructure*	
D3.2	*Interfaces for content analysis and content description infrastructure*	
WP3.4.4	Definition of descriptors and description schemes	
WP3.4.5	Definition of suitable metadata profiles for multimedia content analysis, search and retrieval	
M3.4	*Content analysis and content description infrastructure available to all partners*	
M3.5	*Reports on Multimedia content analysis with appropriate contributions to workshops, conferences and journals*	
M3.6	*Descriptions and profiles for multimedia content analysis*	

B.8.8.3 Gantt chart WP4

Task ID	Task Name	Month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
WP4.1	**Specification of a Multimedia Ontology Infrastructure**	
WP4.1.1	Top-level Multimedia Content Ontology	
M4.6	*Top-level multimedia ontology*	
WP4.1.2	Low-level Visual Feature Ontology	
M4.7	*Low-level visual feature ontology*	
WP4.1.3	Prototype Knowledge Base	
M4.8	*Multimedia knowledge base*	
WP4.2	**Knowledge-assisted Multimedia Analysis**	
WP4.2.1	Numerical to Symbolic Analysis	
M4.1	*First algorithms for numerical to symbolic analysis*	
WP4.2.2	Symbolic to Semantic Analysis	
M4.5	*First algorithms for symbolic to semantic analysis*	
ID4.1	*Report on state-of-the-art in knowledge assisted multimedia analysis*	
D4.2	*Technical report on knowledge extraction*	
WP4.3	**Knowledge-assisted Multimedia Reasoning and Annotation**	
WP4.3.1	Constraint Based Reasoning	
M4.2	*First algorithms for constraint based reasoning*	
WP4.3.2	Rule Based Reasoning	
M4.3	*First algorithms for rule based reasoning*	
WP4.3.3	Content Annotation	
M4.4	*First algorithms for general purpose reasoning and fuzzy extensions to semantic web languages*	
ID4.3	*Report on state-of-the-art in multimedia reasoning*	
D4.1	*Annotation/population tool*	
WP4.4	**Data Mining**	
WP4.4.1	Preparation of a state-of-the-art report on multimedia data mining	
ID4.2	*Report on state-of-the-art report in multimedia data mining*	
WP4.4.2	Research in multimedia data mining	
WP4.5	**Intelligent User Relevance Feedback**	
ID4.4	*State-of-the-art report on user relevance feedback for multimedia annotation & retrieval*	
D4.3	*Technical report on implemented techniques for user relevance feedback*	



B.8.8.4 Gantt chart WP5

Task ID	Task Name	Month 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
WP5.1	**Knowledge Representation for Multimedia**																		
WP5.1.1	Extension of RDF / OWL / SWRL for Representing Semantic Data																		
ID5.1	*Extension of RDF / OWL /SWRL*																		
M5.1	*Extension of RDF / OWL /SWRL*																		
WP5.1.2	Top Level Ontology for Multimedia																		
D5.1	*Top Level Ontology*																		
WP5.1.3	Reasoning with Semantic Multimedia Metadata																		
D5.4	*Extension of RDF / OWL /SWRL - 2nd revision*																		
M5.3	*Extension of RDF / OWL /SWRL - 2nd revision*																		
WP5.2	**Reference Framework for Distributed Semantic Management of Multimedia Metadata**																		
WP5.2.1	Storage of Metadata																		
D5.2	*Metadata store*																		
WP5.2.2	Efficient Distributed Querying of Metadata																		
WP5.2.3	Individual Organization of Semantic Multimedia-Data																		
ID5.3	*Individual Organization Prototype*																		
WP5.3	**Semantics-based Interaction with Multimedia**																		
WP5.3.1	Semantic Retrieval																		
D5.3	*Semantic Retrieval*																		
M5.2	*Semantic Retrieval*																		
WP5.3.2	Semantics-based Presentation of Multimedia																		
WP5.3.3	Manual and semi-automatic semantic annotation																		
ID5.2	*Semantic Annotation - Version 1 - semi-automatic*																		
WP5.4	**Knowledge Extraction from Complementary Sources**																		
WP5.4.1	Mining Primary Resources																		
ID5.4	*Mining Primary Resources*																		

B.8.8.5 Gantt chart WP6

Task ID	Task Name	Month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
WP6.1	**Distributed Research Environment Design and Implementation**	
WP6.1.1	Distributed research environment requirements specification	
ID6.2	*Requirements for distributed research environment*	
WP6.1.2	Study and selection of suitable network communication mechanisms	
WP6.1.3	Study and selection of suitable media database management tools	
WP6.1.4	Study and selection of suitable machine independent interface technologies	
D6.1	*Distributed research environment specification*	
WP6.1.5	Initial instantiation of distributed framework	
D6.3	*First implementation of distributed research environment*	
M6.2	*First implementation of distributed research environment*	
WP6.2	**Research resource sharing**	
WP6.2.1	Review of existing and planned resources	
ID6.1	*Initial review of partners' research resources*	
WP6.2.2	Collection and organisation of test content repository	
WP6.2.3	Collection and organisation of analysis software repository	
WP6.2.4	Identification of a suite of front end user interfaces	
D6.2	*Contents and description of shared resource repositories*	
M6.1	*Contents and description of shared resource repositories*	

B.8.8.6 Gantt chart WP7

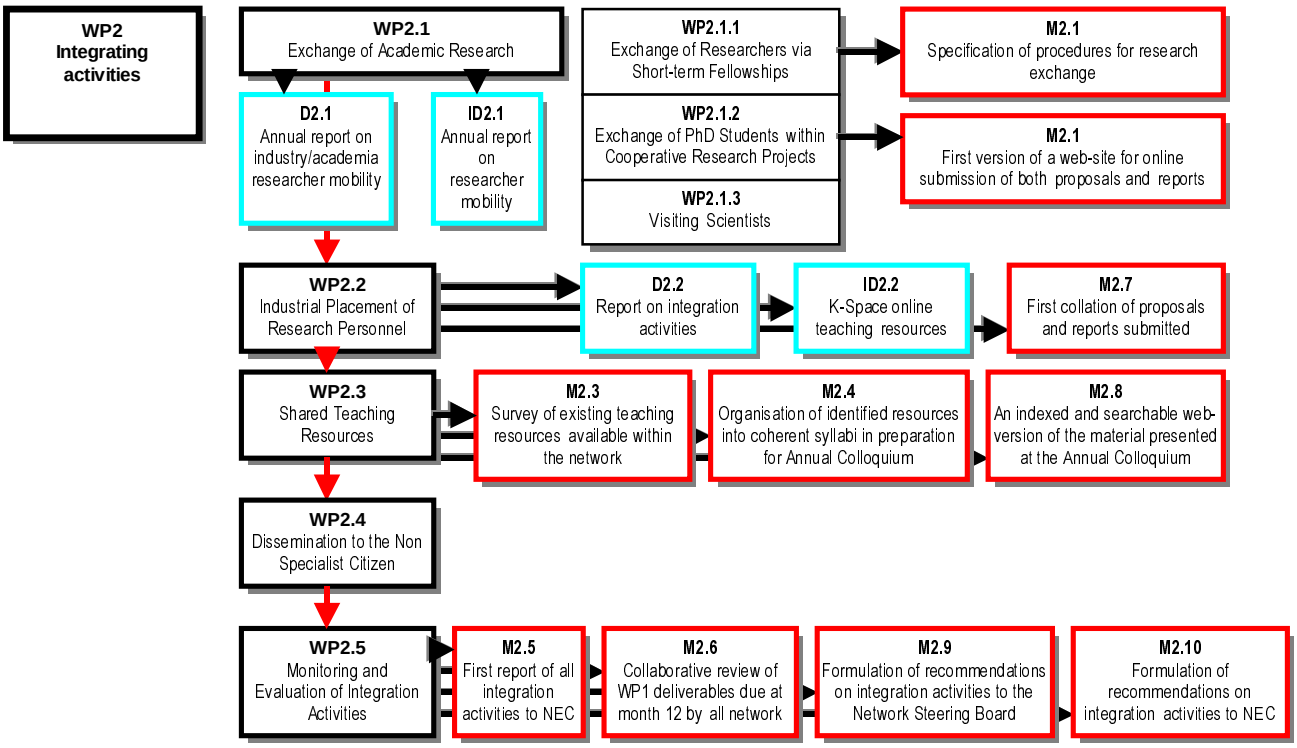
Task ID	Task Name	Month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
WP7.1	**Website and electronic newsletter**	
WP7.1.1	The K-Space website	
D7.2	*Web portal*	
WP7.1.2	Bimonthly electronic newsletter	
D7.1	*Bimonthly newsletter*	
WP7.2	**K-Space Conference - EWIMT**	
D7.5. (1,2,3)	*Proceedings of EWIMT*	
WP7.3	**Towards a Scientific Forum in Multimedia Knowledge Extraction and Analysis**	
ID7.2	*Report on the viability of a scientific forum in knowledge-based multimedia analysis*	
WP7.4	**Joint publications**	
WP7.4.1	Special sessions In relevant conferences	
WP7.4.2	Special Issue in Leading Technical Journals	
ID7.1	*Report on special sessions in leading conferences*	
M7.2	*Agreement for K-Space special sessions at a major conference*	
WP7.5	**Short courses and training programs**	
WP7.5.1	K-Space Tutorials	
D7.3	*First K-Space tutorials, Web seminars and short courses for Industry*	
WP7.5.2	Web seminars	
D7.4	*First web seminar*	
WP7.5.3	Summer school program	
D7.6	*First yearly summer school*	
WP7.5.4	Short courses for industry	
D7.9	*First short courses for Industry*	
WP7.5.5	European Master/PhD program and short courses	
D7.7	*First Yearly report on the European integration of Master and doctoral programs*	
M7.3	*Web seminars encoded for streaming and download*	
M7.5	*First short courses for industry (3 day session)*	
WP7.6	**Exhibitions and demonstrations**	
M7.6	*Active participation to a major exhibition event*	
WP7.7	**Contribution to standards**	
D7.8	*First Yearly report on Standardisation contributions*	
M7.1	*First one-day meeting with the Industrial Advisory Board*	
M7.4	*Second one-day meeting with the extended Industrial Advisory Board*	
WP7.8	**Technology transfer**	
ID7.3	*Technology transfer initiatives and feedback from Industry*	

B.8.8.7 Gantt chart WP1

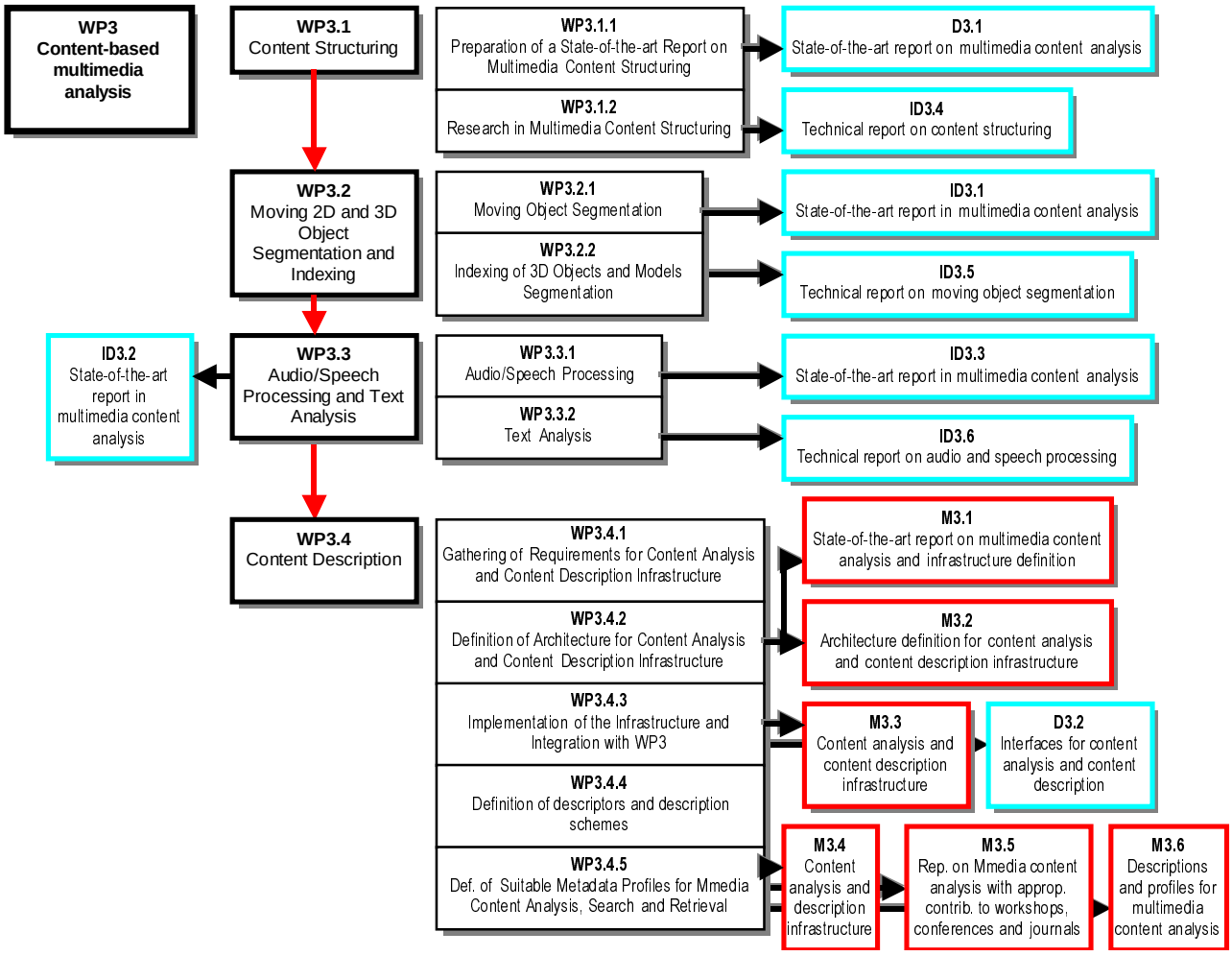
Task ID	Task Name	Month 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
WP1.1	**Management Charter**																		
ID1.2	*Management Charter*																		
WP1.2	**Communication with the EU Commission**																		
D1.1	*Regular management and progress reports*																		
WP1.3	**Financial Planning**																		
ID1.1	*Yearly financial plan*																		
WP1.4	**Accounting and financial audits**																		
D1.2	*Financial audit reports*																		
WP1.6	**Concertation, Consensus and Clusters**																		
WP1.5	**Handling of Legal and Ethical matters**																		
WP1.6	**Concertation, Consensus and Clusters**																		
WP1.7	**Overall coordination of the jointly activities of the network**																		
WP1.8	**Quality assurance and technical auditing**																		
D1.3	*Reports on technical audits and Internal reports*																		
WP1.9	**Gender and social Issues**																		
D1.4	*Status Report*																		

B.8.8.8 Workpackage interpendencies (Pert diagrams)

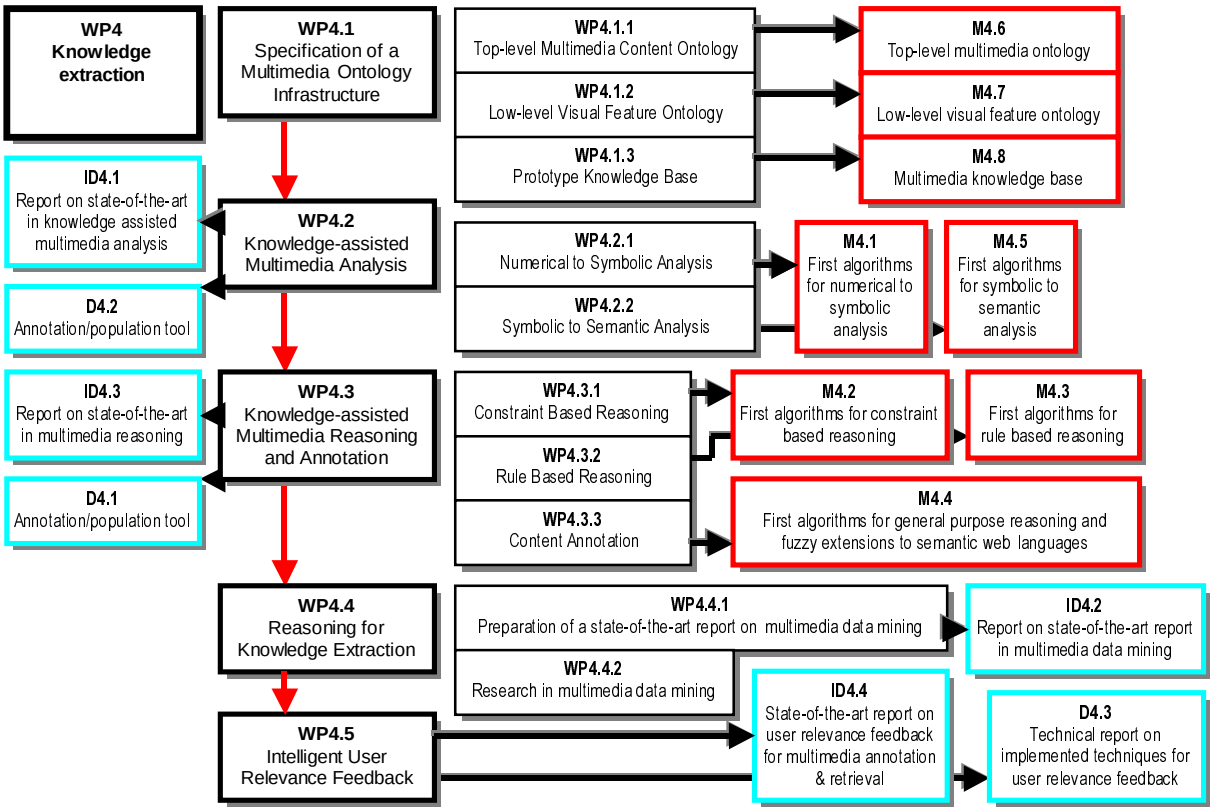
WP2



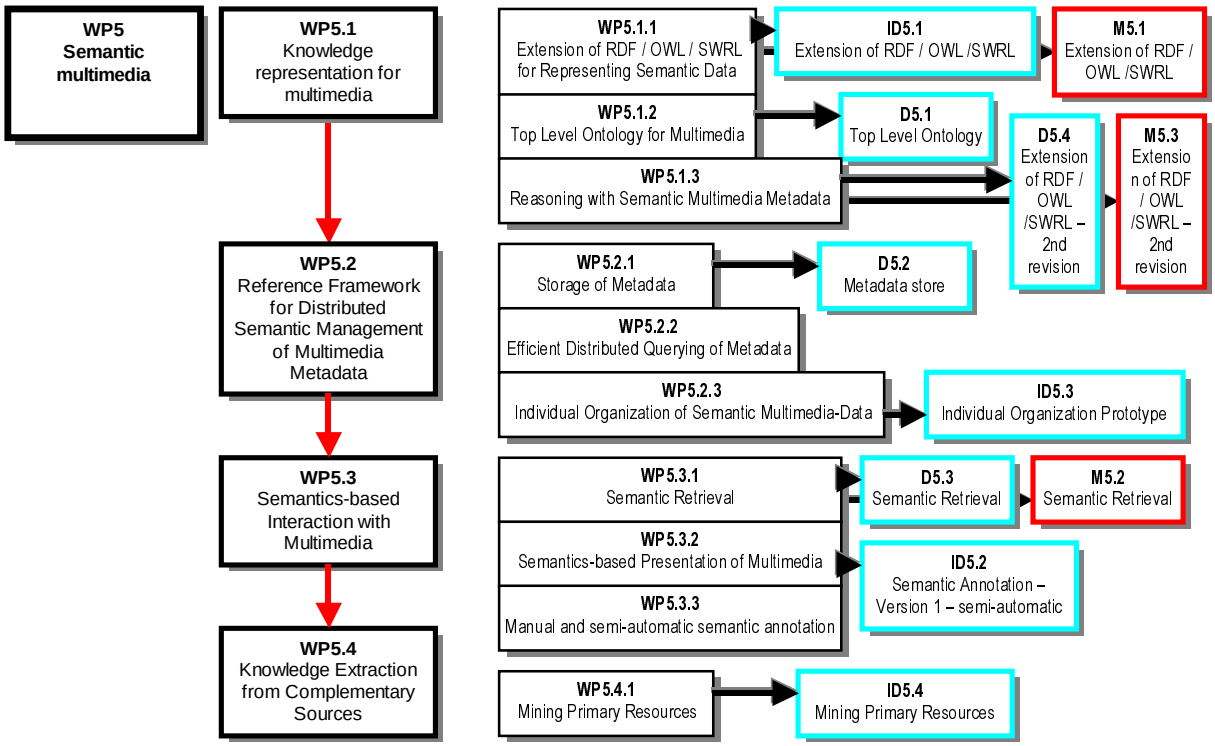
WP3


WP3
Content-based multimedia analysis
WP3.1
Content Structuring
WP3.1.1
Preparation of a State-of-the-art Report on Multimedia Content Structuring
WP3.1.2
Research in Multimedia Content Structuring
D3.1
State-of-the-art report on multimedia content analysis
ID3.4
Technical report on content structuring
WP3.2
Moving 2D and 3D Object Segmentation and Indexing
WP3.2.1
Moving Object Segmentation
WP3.2.2
Indexing of 3D Objects and Models Segmentation
ID3.1
State-of-the-art report in multimedia content analysis
ID3.5
Technical report on moving object segmentation
ID3.2
State-of-the-art report in multimedia content analysis
WP3.3
Audio/Speech Processing and Text Analysis
WP3.3.1
Audio/Speech Processing
WP3.3.2
Text Analysis
ID3.3
State-of-the-art report in multimedia content analysis
ID3.6
Technical report on audio and speech processing
WP3.4
Content Description
WP3.4.1
Gathering of Requirements for Content Analysis and Content Description Infrastructure
WP3.4.2
Definition of Architecture for Content Analysis and Content Description Infrastructure
WP3.4.3
Implementation of the Infrastructure and Integration with WP3
WP3.4.4
Definition of descriptors and description schemes
WP3.4.5
Def. of Suitable Metadata Profiles for Mmedia Content Analysis, Search and Retrieval
M3.1
State-of-the-art report on multimedia content analysis and infrastructure definition
M3.2
Architecture definition for content analysis and content description infrastructure
M3.3
Content analysis and content description infrastructure
D3.2
Interfaces for content analysis and content description
M3.4
Content analysis and description infrastructure
M3.5
Rep. on Mmedia content analysis with approp. contrib. to workshops, conferences and journals
M3.6
Descriptions and profiles for multimedia content analysis

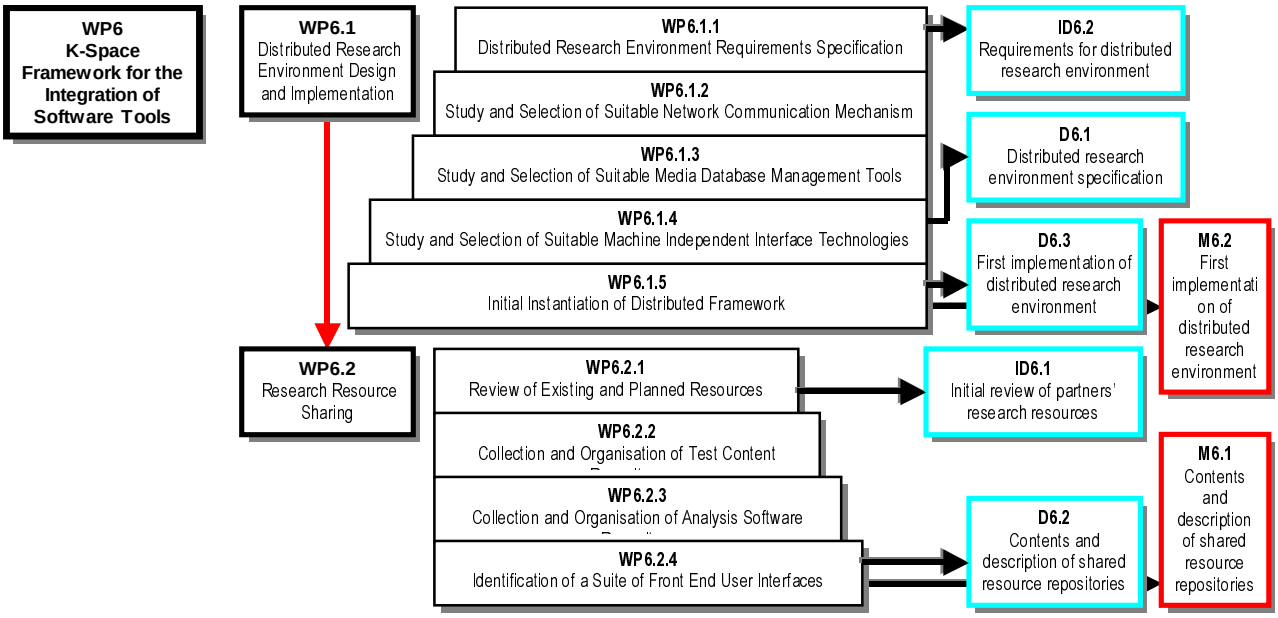
WP4


WP4
Knowledge extraction
WP4.1
Specification of a Multimedia Ontology Infrastructure
WP4.1.1
Top-level Multimedia Content Ontology
WP4.1.2
Low-level Visual Feature Ontology
WP4.1.3
Prototype Knowledge Base
M4.6
Top-level multimedia ontology
M4.7
Low-level visual feature ontology
M4.8
Multimedia knowledge base
ID4.1
Report on state-of-the-art in knowledge assisted multimedia analysis
WP4.2
Knowledge-assisted Multimedia Analysis
WP4.2.1
Numerical to Symbolic Analysis
WP4.2.2
Symbolic to Semantic Analysis
M4.1
First algorithms for numerical to symbolic analysis
M4.5
First algorithms for symbolic to semantic analysis
D4.2
Annotation/population tool
ID4.3
Report on state-of-the-art in multimedia reasoning
WP4.3
Knowledge-assisted Multimedia Reasoning and Annotation
WP4.3.1
Constraint Based Reasoning
WP4.3.2
Rule Based Reasoning
WP4.3.3
Content Annotation
M4.2
First algorithms for constraint based reasoning
M4.3
First algorithms for rule based reasoning
M4.4
First algorithms for general purpose reasoning and fuzzy extensions to semantic web languages
D4.1
Annotation/population tool
WP4.4
Reasoning for Knowledge Extraction
WP4.4.1
Preparation of a state-of-the-art report on multimedia data mining
WP4.4.2
Research in multimedia data mining
ID4.2
Report on state-of-the-art report in multimedia data mining
WP4.5
Intelligent User Relevance Feedback
ID4.4
State-of-the-art report on user relevance feedback for multimedia annotation & retrieval
D4.3
Technical report on implemented techniques for user relevance feedback

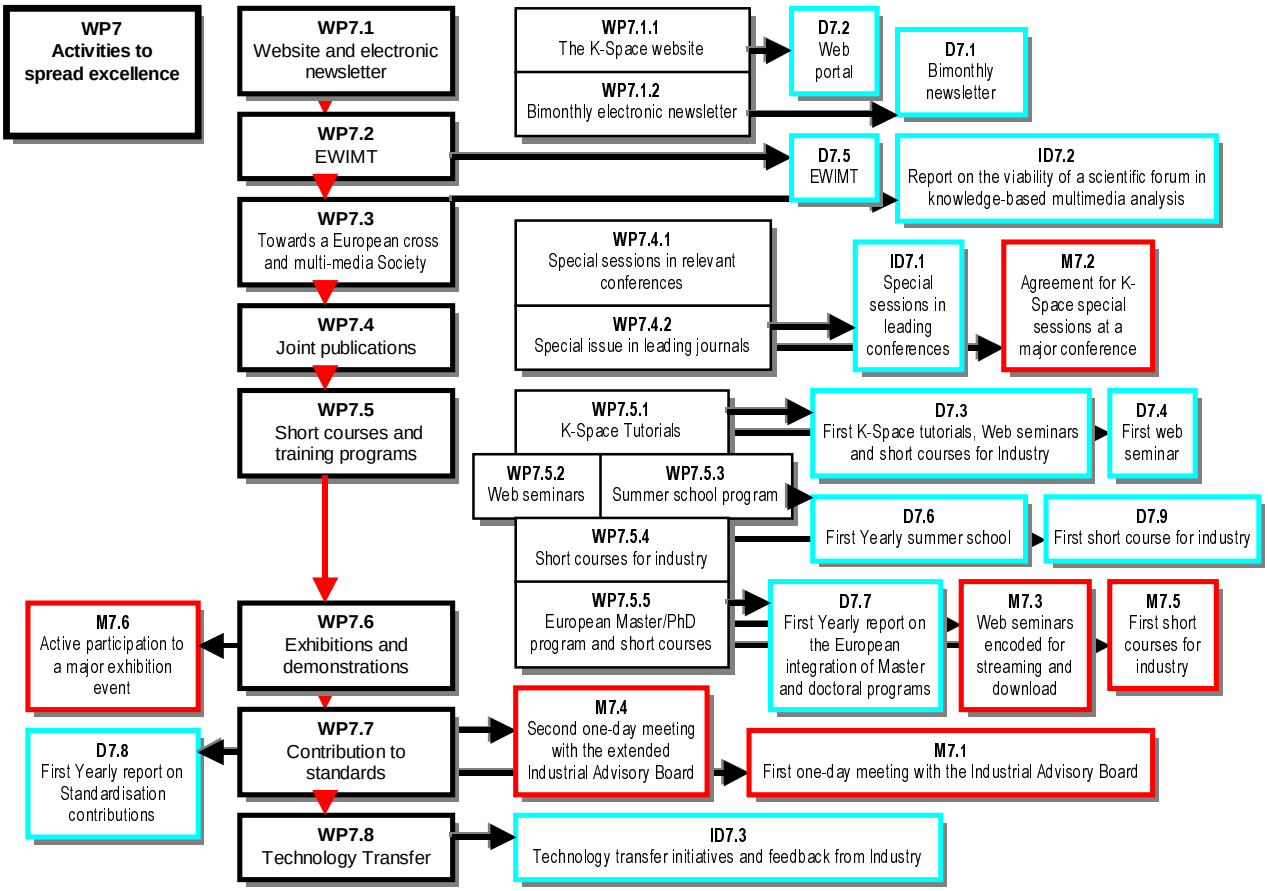
WP5


WP5
Semantic multimedia
WP5.1
Knowledge representation for multimedia
WP5.2
Reference Framework for Distributed Semantic Management of Multimedia Metadata
WP5.3
Semantics-based Interaction with Multimedia
WP5.4
Knowledge Extraction from Complementary Sources
WP5.1.1
Extension of RDF / OWL / SWRL for Representing Semantic Data
WP5.1.2
Top Level Ontology for Multimedia
WP5.1.3
Reasoning with Semantic Multimedia Metadata
ID5.1
Extension of RDF / OWL /SWRL
D5.1
Top Level Ontology
D5.4
Extension of RDF / OWL /SWRL – 2nd revision
M5.1
Extension of RDF / OWL /SWRL
M5.3
Extension of RDF / OWL /SWRL – 2nd revision
WP5.2.1
Storage of Metadata
WP5.2.2
Efficient Distributed Querying of Metadata
WP5.2.3
Individual Organization of Semantic Multimedia-Data
D5.2
Metadata store
ID5.3
Individual Organization Prototype
WP5.3.1
Semantic Retrieval
WP5.3.2
Semantics-based Presentation of Multimedia
WP5.3.3
Manual and semi-automatic semantic annotation
D5.3
Semantic Retrieval
M5.2
Semantic Retrieval
ID5.2
Semantic Annotation – Version 1 – semi-automatic
WP5.4.1
Mining Primary Resources
ID5.4
Mining Primary Resources

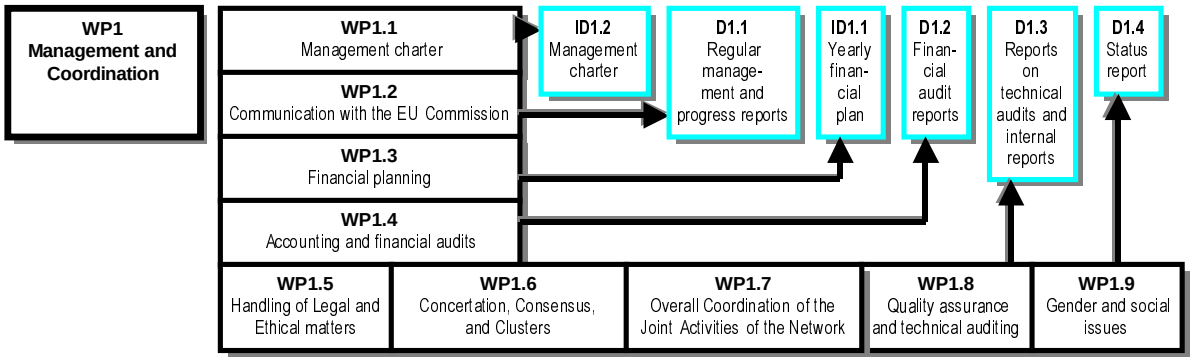
WP6


WP6
K-Space Framework for the Integration of Software Tools
WP6.1
Distributed Research Environment Design and Implementation
WP6.1.1
Distributed Research Environment Requirements Specification
WP6.1.2
Study and Selection of Suitable Network Communication Mechanism
WP6.1.3
Study and Selection of Suitable Media Database Management Tools
WP6.1.4
Study and Selection of Suitable Machine Independent Interface Technologies
WP6.1.5
Initial Instantiation of Distributed Framework
ID6.2
Requirements for distributed research environment
D6.1
Distributed research environment specification
D6.3
First implementation of distributed research environment
M6.2
First implementation of distributed research environment
WP6.2
Research Resource Sharing
WP6.2.1
Review of Existing and Planned Resources
WP6.2.2
Collection and Organisation of Test Content
WP6.2.3
Collection and Organisation of Analysis Software
WP6.2.4
Identification of a Suite of Front End User Interfaces
ID6.1
Initial review of partners' research resources
D6.2
Contents and description of shared resource repositories
M6.1
Contents and description of shared resource repositories

WP7


WP7
Activities to spread excellence
WP7.1
Website and electronic newsletter
WP7.2
EWIMT
WP7.3
Towards a European cross and multi-media Society
WP7.4
Joint publications
WP7.5
Short courses and training programs
WP7.6
Exhibitions and demonstrations
WP7.7
Contribution to standards
WP7.8
Technology Transfer
WP7.1.1
The K-Space website
WP7.1.2
Bimonthly electronic newsletter
D7.2
Web portal
D7.1
Bimonthly newsletter
D7.5
EWIMT
ID7.2
Report on the viability of a scientific forum in knowledge-based multimedia analysis
WP7.4.1
Special sessions in relevant conferences
WP7.4.2
Special issue in leading journals
ID7.1
Special sessions in leading conferences
M7.2
Agreement for K-Space special sessions at a major conference
WP7.5.1
K-Space Tutorials
WP7.5.2
Web seminars
WP7.5.3
Summer school program
WP7.5.4
Short courses for industry
WP7.5.5
European Master/PhD program and short courses
D7.3
First K-Space tutorials, Web seminars and short courses for Industry
D7.4
First web seminar
D7.6
First Yearly summer school
D7.9
First short course for industry
D7.7
First Yearly report on the European integration of Master and doctoral programs
M7.3
Web seminars encoded for streaming and download
M7.5
First short courses for industry
M7.6
Active participation to a major exhibition event
D7.8
First Yearly report on Standardisation contributions
M7.4
Second one-day meeting with the extended Industrial Advisory Board
M7.1
First one-day meeting with the Industrial Advisory Board
ID7.3
Technology transfer initiatives and feedback from Industry

WP1


WP1
Management and Coordination
WP1.1
Management charter
WP1.2
Communication with the EU Commission
WP1.3
Financial planning
WP1.4
Accounting and financial audits
ID1.2
Management charter
D1.1
Regular manage-ment and progress reports
ID1.1
Yearly finan-cial plan
D1.2
Finan-cial audit reports
D1.3
Reports on technical audits and internal reports
D1.4
Status report
WP1.5
Handling of Legal and Ethical matters
WP1.6
Concertation, Consensus, and Clusters
WP1.7
Overall Coordination of the Joint Activities of the Network
WP1.8
Quality assurance and technical auditing
WP1.9
Gender and social issues

B.8.9 Tables

B.8.9.1 Workpackage list (18 months)

Work-package No[3]	Workpackage title	Lead contractor No[4]	Start month[5]	End month[6]	Deliverable No[7]
WP1	Consortium management activities	1(QMUL)	1	18	D1.1 , D1.2, D1.3, D1.4, D1.8, D1.9, D1.10
WP2	Integrating activities	11(DFKI)	1	18	D2.1, D2.2, D2.3, D2.4
WP3	Content-based multimedia analysis	3(JRS)	1	18	D3.1.1, D3.1.2, , D3.2.1, D3.2.2, D3.3.1, D3.3.2, D3.4.1, D3.4.2, D3.4.3, D3.4.4
WP4	Knowledge extraction	4(ITI)	1	18	D4.1.1, D4.1.2, D4.1.3, D4.1.4, D4.2.1, D4.2.3, D4.3.1, D4.3.2, D4.3.3, D4.3.4 D4.4.1, D4.4.2
WP5	Semantic multimedia	2(KU)	1	18	D5.1.1, D5.1.2, D5.1.3, D5.2.1, D5.2.2, D5.3.1, D5.3.2, D5.4
WP6	K-Space Framework for the Integration of Software Tools	5(DCU)	1	18	D6.1.1, D6.1.2, D6.1.3, D6.2.1, D6.2.2
WP7	Activities to spread excellence	10(GU)	1	18	D7.1.1, D7.1.2, D7.2, D7.3, D7.4, D7.5.1, D7.5.2, D7.5.3, D7.5.4, D7.5.5, D7.7, D7.8
7	**TOTAL**				

[4] Number of the contractor leading the work in this workpackage.
[5] Relative start date for the work in the specific workpackages, month 0 marking the start of the project, and all other start dates being relative to this start date.
[6] Relative end date, month 0 marking the start of the project, and all ends dates being relative to this start date.
[7] Deliverable number: Number for the deliverable(s)/result(s) mentioned in the workpackage: D1 - Dn.

B.8.9.2 Deliverables list (18 months)

B.8.9.2.1 External deliverables

Deliverable no	Deliverable title	Delivery date
D1.1	Regular management and progress reports.	M6,12,18
D1.2	Financial audit reports	M12
D1.3	Reports on technical audits and internal reports	M12
D1.4	Status report	M14
D2.1	Annual report on researcher mobility	M12
D2.2	Report on integration activities	M12
D3.1	State-of-the-art report in multimedia content analysis (content structuring part)	M5
D3.2	Interfaces for content analysis and content description infrastructure	M10
D4.1	Annotation/population tool	M10
D4.2	Technical report on knowledge extraction	M18
D4.3	Technical report on implemented techniques for user relevance feedback,	M18
D5.1	Top Level Ontology	M12
D5.2	Metadata store	M12
D5.3	Semantic Retrieval	M15
D5.4	Extension of RDF / OWL /SWRL – 2nd revision	M18
D6.1	Distributed research environment specification	M10
D6.2	Contents and description of shared resource repositories	M10
D6.3	First implementation of distributed research environment	M18
D7.1	Bimonthly newsletter	M2,4,..18
D7.2	Web portal	M3
D7.3	First K-Space tutorials, Web seminars and short courses for Industry	M7
D7.4	First web seminar	M7
D7.5.(1,2,3)	Proceedings of EWIMT, (K-Space Partner hosting EWIMT'06, '07, '08)	M12, 24, 36
D7.6	First yearly summer school	M12
D7.7	First Yearly report on the European integration of Master and doctoral programs	M12
D7.8	First Yearly report on Standardisation contributions	M12
D7.9	First short course for industry	M14

B.8.9.2.2 Internal deliverables

Deliverable no	Deliverable title	Delivery date
D1.1	Yearly financial plan	M1,13
D1.2	Management charter	M3
D2.1	Annual report on researcher mobility	M12
D2.2	K-Space online teaching resources	M18
D3.1	State-of-the-art report in multimedia content analysis (moving object segmentation part)	M4
D3.2	State-of-the-art report in multimedia content analysis (audio and speech processing part)	M4
D3.3	State-of-the-art report in multimedia content analysis (text analysis part)	M4
D3.4	Technical report on content structuring	M18
D3.5	Technical report on moving object segmentation	M18
D3.6	Technical report on audio and speech processing	M18
D4.1	Report on state-of-the-art in knowledge assisted multimedia analysis	M4
D4.2	Report on state-of-the-art in multimedia data mining	M4
D4.3	Report on state-of-the-art in multimedia reasoning	M5
D4.4	State-of-the-art report on user relevance feedback for multimedia annotation & retrieval	M5
D5.1	Extension of RDF / OWL /SWRL	M9
D5.2	Semantic Annotation – Version 1 – semi-automatic	M15
D5.3	Individual Organization Prototype	M18
D5.4	Mining Primary Resources	M18
D6.1	Initial review of partners' research resources	M3
D6.2	Requirements for distributed research environment	M4
D7.1	Report on special sessions in leading conferences	M10
D7.2	Report on the viability of a scientific forum in knowledge-based multimedia analysis	M12
D7.3	Technology transfer initiatives and feedback from Industry	M14

B.8.9.3 Milestone list (18 months)

Milestone no	Milestone title	Achieve date
M2.1	Specification of procedures for research exchange	M3
M2.2	First version of a web-site for online submission of both proposals and reports	M3
M2.3	Survey of existing teaching resources available within the network	M6
M2.4	Organisation of identified resources into coherent syllabi in preparation for Annual Colloquium	M9
M2.5	First report of all integration activities to NEC	M12
M2.6	Collaborative review of WP1 deliverables due at month 12 by all network participants	M15
M2.7	First collation of proposals and reports submitted	M18
M2.8	An indexed and searchable web-version of the material presented at the Annual Colloquium	M18
M2.9	Formulation of recommendations on integration activities to the Network Steering Board	M18
M2.10	Formulation of recommendations on integration activities to NEC	M18
M3.1	State-of-the-art report on multimedia content analysis and infrastructure definition	M5
M3.2	Architecture definition for content analysis and content description infrastructure	M5
M3.3	Content analysis and content description infrastructure	M10
M3.4	Content analysis and content description infrastructure available to all partners	M18
M3.5	Reports on Multimedia content analysis with appropriate contributions to workshops, conferences and journals	M18
M3.6	Descriptions and profiles for multimedia content analysis	M18
M4.1	First algorithms for numerical to symbolic analysis	M4
M4.2	First algorithms for constraint based reasoning	M4
M4.3	First algorithms for rule based reasoning	M4
M4.4	First algorithms for general purpose reasoning and fuzzy extensions to semantic web languages	M4
M4.5	First algorithms for symbolic to semantic analysis	M10
M4.6	Top-level multimedia ontology	M18
M4.7	Low-level visual feature ontology	M18
M4.8	Multimedia knowledge base	M18
M5.1	Extension of RDF / OWL /SWRL	M9
M5.2	Semantic Retrieval	M15
M5.3	Extension of RDF / OWL /SWRL – 2nd revision	M18
M6.1	Contents and description of shared resource repositories	M10
M6.2	First implementation of distributed research environment	M18
M7.1	First one-day meeting with the Industrial Advisory Board	M2
M7.2	Agreement for K-Space special sessions at a major conference	M3
M7.3	Web seminars encoded for streaming and download	M7
M7.4	Second one-day meeting with the extended Industrial Advisory Board	M12
M7.5	First short courses for industry (3 day session)	M14
M7.6	Active participation to a major exhibition event	M18

B.8.9.4 Workpackage description tables

WP2		Start date or starting event:	M1
Integrating activities			
Participant id	**11(DFKI)***	**All members of the Network**	

Objectives

- To create a sustainable and lasting relationships between partners
- To take care of growth of interdisciplinary collaborative research aligned with research objectives
- To create new inter-disciplinary links and bonds between partners not possible via other routes

Description of work

The WP2 will facilitate the exchange of personnel within the network. Specifically, it targets: placement of researchers from academic partners for short stays in the laboratories of other partners; shorter visits of senior academic personnel for information exchange and identification of synergies; placement of personnel from the academic partners with industrial players as interns so that K-Space researchers become familiar with the requirements, methods and practices of industry.

WP2.1 Exchange of Academic Research Personnel (M1-18): Aims to facilitate the mobility of research personnel within the Network. Students and post-docs from one institution will be hosted within the laboratory of another institution. Short visits by senior researchers to other network participants will be organised to exchange expertise and foster new collaborations.

- **WP2.1.1** Exchange of Researchers via Short-term Fellowships (M1-18)
- **WP2.1.2** Exchange of PhD Students within Cooperative Research Projects (M1-38)
- **WP2.1.3** Visiting Scientists (M1-18)

WP2.2 Industrial Placement of Research Personnel (M1-18): Special liaison activities and placements will be sought with the members of the K-Space Industrial Advisory Board. Finishing PhD students will spend time as interns at the industrial partners, prior to taking the next step in their career.

- **WP2.2.1** Short-term Industrial Fellowships (M1-36)
- **WP2.2.2** Take-up of PhD Students for Industrial Experience (M1-36)

WP2.3 Shared Teaching Resources (M1-18): Web-repository of Undergraduate and Postgraduate Teaching Materials: Collecting all teaching resources within the network into a searchable archive.

WP2.4: Dissemination to the non specialist citizen (M6-18) Establish at an early stage main interest of end users. This will provide feedback on the technical developments of the NoE and contribute to the success of the research, hence to the sustainability of the NoE.

WP2.5 Monitoring and Evaluation of Integration Activities (M1-18): Reporting on the success (or otherwise) of network integration activities.

Deliverables

D2.1 (M12) Annual report on industry/academia researcher mobility, (UEP)
D2.2 (M12) Report on integration activities, (DCU)

Internal deliverables

ID2.1 (M12) Annual report on researcher mobility, (GU)
ID2.2 (M18) K-Space online teaching resources, (TUB)

Milestones and expected result

M2.1 (M3) Specification of procedures for research exchange
M2.2 (M3) First version of a web-site for online submission of both proposals and reports
M2.3 (M6) Survey of existing teaching resources available within the network
M2.4 (M9) Organisation of identified resources into coherent syllabi in preparation for Annual Colloquium
M2.5 (M12) First report of all integration activities to NEC
M2.6 (M15) Collaborative review of WP1 deliverables due at month 12 by all network participants
M2.7 (M18) First collation of proposals and reports submitted
M2.8 (M18) An indexed and searchable web-version of the material presented at the Annual Colloquium
M2.9 (M18) Formulation of recommendations on integration activities to the Network Steering Board
M2.10 (M18) Formulation of recommendations on integration activities to NEC

* Workpackage leader

WP3		Start date or starting event:	M1
Content-based multimedia analysis			
Participant id	**3(JRS)***	**All members of the Network**	

Objectives

This WP will research low- to mid-level content analysis techniques suitable for higher level semantic inference in the following areas:

- Content structuring
- Moving Object segmentation
- Audio-/Speech processing

Appropriate descriptors/description schemes and profiles will be developed as well as a common infrastructure for content analysis and description implemented based on existing components.

Description of work

WP3.1 Content Structuring (M1-10): Working towards decoding the "grammar of moving images" and giving the user a high level structural overview on the content.

- **WP3.1.1** Preparation of a State-of-the-art Report on Multimedia Content Structuring (M1-4)
- **WP3.1.2** Research in Multimedia Content Structuring (M1-18)

WP3.2 Moving 2D and 3D Object Segmentation and Indexing (M1-18): Will investigate approach to moving object segmentation. The extracted objects will be described in a manner suitable for higher level knowledge extraction.

- **WP3.2.1** Moving Object Segmentation (M1-4)
- **WP3.2.2** Indexing of 3D Objects and Models Segmentation (M1-18)

WP3.3 Audio/Speech Processing and Text Analysis (M1-18): Extension of state-of-the-art processing and analysis algorithms to handle high-level, conceptual representations of knowledge embedded in audiovisual and textual content based on reference ontologies and intelligence techniques will be explored.

- **WP3.3.1** Audio/Speech Processing (M1-18)
- **WP3.3.2** Text Analysis (M1-18)

WP3.4 Content Description (M3-24): Definition of descriptors/description schemes and profiles as well as implementation of a common infrastructure for content analysis and description based on existing components.

- **WP3.4.1** Gathering of Requirements for Content Analysis and Content Description Infrastructure (M1-3)
- **WP3.4.2** Definition of Architecture for Content Analysis and Content Description Infrastructure (M3-5)
- **WP3.4.3** Implementation of the Infrastructure and Integration with WP3 (M5-10)
- **WP3.4.4** Definition of descriptors and description schemes (M10-18)
- **WP3.4.5** Def. of Suitable Metadata Profiles for Media Content Analysis, Search and Retrieval (M10-18)

Deliverables

D3.1 (M5) State-of-the-art report on multimedia content analysis (content structuring part), (JRS)
D3.2 (M10) Interfaces for content analysis and content description infrastructure, (JRS)

Internal deliverables

ID3.1 (M4) State-of-the-art report in multimedia content analysis (moving object segmentation part), (DCU)
ID3.2 (M4) State-of-the-art report in multimedia content analysis (audio and speech processing part), (GET)
ID3.3 (M4) State-of-the-art report in multimedia content analysis (text analysis part), (DFKI)
ID3.4 (M18) Technical report on content structuring, (JRS)
ID3.5 (M18) Technical report on moving object segmentation, (DCU)
ID3.6 (M18) Technical report on audio and speech processing, (GET)

Milestones and expected result

M3.1 (M5) State-of-the-art report on multimedia content analysis and infrastructure definition
M3.2 (M5) Architecture definition for content analysis and content description infrastructure
M3.3 (M10) Content analysis and content description infrastructure
M3.4 (M18) Content analysis and content description infrastructure available to all partners
M3.5 (M18) Rep. on Media content analysis with contributions to workshops, conferences and journals
M3.6 (M18) Descriptions and profiles for multimedia content analysis

WP4			**Start date or starting event:**		**M1**	
Knowledge extraction						
Participant id		**1(QMUL)**	**2(KU)**	**3(JRS)**	**4(ITI)***	**5(DCU)**
6(CWI)	**7(GET)**	**8(INA)**	**9(EURECOM)**	**10(GU)**	**11(DFKI)**	**13(EPFL)**

Objectives

- To provide techniques for the semantic analysis, annotation and retrieval of multimedia content.
- To be based on knowledge assisted content analysis and annotation using a multimedia ontology infrastructure.
- Semantic and low-level attributes of the objects to be detected in combination with appropriately defined rules developed within WP4

Description of work

WP4.1 Specification of a Multimedia Ontology Infrastructure (M1-18):focuses on the development of a multimedia ontology infrastructure based on the knowledge representation infrastructure and language extensions developed within WP5.

- **WP4.1.1** Top-level Multimedia Content Ontology (M1-18)
- **WP4.1.2** Low-level Visual Feature Ontology (M1-18)
- **WP4.1.3** Prototype Knowledge Base (M1-18)

WP4.2 Knowledge-assisted Multimedia Analysis (M1-18): deals with the semantic object detection, exploiting the ontologies of WP4.1 and the content processing algorithms of WP3 in order to apply the most appropriate detection steps for the analysis process.

- **WP4.2.1** Numerical to Symbolic Analysis (M1-12)
- **WP4.2.2** Symbolic to Semantic Analysis (M8-18)

WP4.3 Knowledge-assisted Multimedia Reasoning and Annotation (M1-18): deals with the extraction of meaningful interpretation of high level events and automatic semantic annotation of multimedia content, in collaboration with numerical and symbolic analysis of WP6.2.

- **WP4.3.1** Constraint Based Reasoning (M1-18)
- **WP4.3.2** Rule Based Reasoning (M1-18)
- **WP4.3.3** Content Annotation (M1-18)

WP4.4 Data Mining (M1-18): Will investigate the development of effective and efficient techniques for data mining. Such approaches will cater not just knowledge extraction but also information retrieval in context.

- **WP4.4.1** Preparation of a state-of-the-art report on multimedia data mining (M1-4)
- **WP4.4.2** Research in multimedia data mining (M1-18)

WP4.5 Intelligent User Relevance Feedback (M1-18): aims at exploiting human-machine interaction to derive semantic information from past experience using relevance feed-back.

Deliverables

D4.1 (M10) Annotation/population tool, (ITI)
D4.2 (M18) Technical report on knowledge extraction, (ITI)
D4.3 (M18) Technical report on implemented techniques for user relevance feedback, (QMUL)

Internal deliverables

ID4.1 (M4) Report on state-of-the-art in knowledge assisted multimedia analysis, (ITI)
ID4.2 (M4) Report on state-of-the-art in multimedia data mining, (GU)
ID4.3 (M5) Report on state-of-the-art in multimedia reasoning, (INA)
ID4.4 (M5) State-of-the-art report on user relevance feedback for multimedia annotation & retrieval, (QMUL)

Milestones and expected result

M4.1 (M4) First algorithms for numerical to symbolic analysis
M4.2 (M4) First algorithms for constraint based reasoning
M4.3 (M4) First algorithms for rule based reasoning
M4.4 (M4) First algorithms for general purpose reasoning and fuzzy extensions to semantic web languages
M4.5 (M10) First algorithms for symbolic to semantic analysis
M4.6 (M18) Top-level multimedia ontology
M4.7 (M18) Low-level visual feature ontology
M4.8 (M18) Multimedia knowledge base

WP5		Start date or starting event:		M1	
Semantic multimedia					
Participant id	**1(QMUL)**	**2(KU)***	**3(JRS)**	**4(ITI)**	**6(CWI)**
		8(INA)	**10(GU)**	**11(DFKI)**	**14(UEP)**

Objectives

- To use and extend semantic web technology for needs of multimedia analysis and knowledge extraction
- To diminish the gap between semantic technologies and low level multimedia analysis
- To provide an implementation framework that deals with knowledge representation issues specific for multimedia
- To deal with creating, using and presenting semantic metadata in different ways – tailored to the needs of a heterogeneous group of users.

Description of work

WP5.1 Knowledge representation for multimedia (M1-18): Using RDF/OWL/SWRL will provide a more general mechanism for describing quotations. Further, it will investigate existing top level proposal and modify or extend them in a modularised way in order to facilitate the usage of semantic multimedia for the non-specialist. Lastly it will provide the comprehensive means to represent semantic multimedia and reason with it.

- **WP5.1.1** Extension of RDF / OWL / SWRL for Representing Semantic Data (M1-18)
- **WP5.1.2** Top Level Ontology for Multimedia (M1-12)
- **WP5.1.3** Reasoning with Semantic Multimedia Metadata (M13-18)

WP5.2 Reference Framework for Distributed Semantic Management of Multimedia Metadata (M1-18): Firstly, it will take care of efficient storage and querying facilities for semantic metadata at a single station. The second task will be concerned with querying the system for the multimedia that is available in a networked system of peers. Lastly, the reference framework will allow the user to provide their own structuring into folders and semantic categories.

- **WP5.2.1** Storage of Metadata (M1-12)
- **WP5.2.2** Efficient Distributed Querying of Metadata (M13-18)
- **WP5.2.3** Individual Organization of Semantic Multimedia-Data (M7-18)

WP5.3 Semantics-based Interaction with Multimedia (M1-18): Offers the user the possibilities to query for metadata and related content. Adapts results and multimedia database content according to the semantic metadata and user. Extends the existing semantic multimedia metadata by explicit or implicit annotations.

- **WP5.3.1** Semantic Retrieval (M1-15)
- **WP5.3.2** Semantics-based Presentation of Multimedia (M12-18)
- **WP5.3.3** Manual and semi-automatic semantic annotation (M1-18)

WP5.4 Knowledge Extraction from Complementary Sources (M1-18): In the first 18 month it will deal with analysis of the primary resources that are attached to the multimedia data. In the second phase of the project the analysis of the data and text related to the multimedia data will be considered.

- **WP5.4.1** Mining Primary Resources (M1-18)

Deliverables

D5.1 (M12) Top Level Ontology, (KU)
D5.2 (M12) Metadata store, (UEP)
D5.3 (M15) Semantic Retrieval, (DFKI)
D5.4 (M18) Extension of RDF / OWL /SWRL – 2nd revision, (KU)

Internal deliverables

ID5.1 (M9) Extension of RDF / OWL /SWRL, (KU)
ID5.2 (M15) Semantic Annotation – Version 1 – semi-automatic, (DFKI)
ID5.3 (M18) Individual Organization Prototype, (CWI)
ID5.4 (M18) Mining Primary Resources, (DFKI)

Milestones and expected result

M5.1 (M9) Extension of RDF / OWL /SWRL
M5.2 (M15) Semantic Retrieval
M5.3 (M18) Extension of RDF / OWL /SWRL – 2nd revision

WP6		Start date or starting event:	M1
K-Space Framework for the Integration of Software Tools			
Participant id	5(DCU)*	All members of the Network	

Objectives

- To design and instantiate the technical infrastructure required to enable integration activities to take place
- To ensure that the necessary support is in place in order to allow partners to collaborate effectively
- To facilitate research resource sharing between partners

Description of work

All partners involved will contribute to the design and instantiation of the distributed research environment. Resources to be shared will be identified – both existing resources but also and more importantly those developed in the course of the project. It will also ensure that these resources are adapted according to the interfaces specified so that they can be shared in the distributed environment.

WP6.1 Distributed Research Environment Design and Implementation (M1-18): To design a suitable set of specifications that partners can conform to in order to integrate their resources. Given the requirements specified in WP6.1.1, the activities WP6.1.2-4 will carry out a review of the current state-of-the-art technologies for supporting collaborative work. This includes identifying the functionalities that this environment should support in order to facilitate collaborative research. For exchange of data and remote execution of software, remote access to media databases and software repositories and platform independent mechanisms for interfacing Graphical User Interfaces will be studied and selected.

- **WP6.1.1** Distributed Research Environment Requirements Specification (M1-4)
- **WP6.1.2** Study and Selection of Suitable Network Communication Mechanism (M5-10)
- **WP6.1.3** Study and Selection of Suitable Media Database Management Tools (M5-10)
- **WP6.1.4** Study and Selection of Suitable Machine Independent Interface Technologies (M5-10)
- **WP6.1.5** Initial Instantiation of Distributed Framework (M11-18)

WP6.2 Research Resource Sharing (M1-18): To review the existing research resources available within the Network on an ongoing basis and collect these into (distributed) repositories. The existing partners' resources will be identified that can be used in the first implementation of the distributed research environment. The sub-activities do not just gather resources into one large repository that is unusable in any real manner, but rather will also involve wrapping the identified resources in the interfaces identified in WP6.1.

- **WP6.2.1** Review of Existing and Planned Resources (M1-3)
- **WP6.2.2** Collection and Organisation of Test Content Repository (M4-10)
- **WP6.2.3** Collection and Organisation of Analysis Software Repository (M4-10)
- **WP6.2.4** Identification of a Suite of Front End User Interfaces (M4-10)

Deliverables

D6.1 (M10) Distributed research environment specification, (DCU)
D6.2 (M10) Contents and description of shared resource repositories, (DCU)
D6.3 (M18) First implementation of distributed research environment, (DCU)

Internal deliverables

ID6.1 (M3) Initial review of partners' research resources, (DCU)
ID6.2 (M4) Requirements for distributed research environment, (DCU)

Milestones and expected result

M6.1 (M10) Contents and description of shared resource repositories
M6.2 (M18) First implementation of distributed research environment

* Workpackage leader

WP7		Start date or starting event:	M1
Activities to spread excellence			
Participant id	**10(GU)***	**All members of the Network**	

Objectives

Spreading excellence of the results and findings of research of this NoE will be targeting three groups:

- Academics, here the typical instruments known in academic communities will be used.
- Industry/business players. Here specific instruments will be used so that both the industrial players and the academics can contribute and benefit.
- Specialist citizen. The aim is to tailor the results of the K-Space activity to benefit the needy citizens.

Description of work

WP7.1 Website and electronic newsletter (M1-18): The K-Space website will provide access to training materials, web seminars, conference and meetings information. It will be a first level of communication between members of the NoE and will also be an important, externally visible facet of K-Space.

- **WP7.1.1** The K-Space website (M1-18)
- **WP7.1.2** Bimonthly electronic newsletter (M1-18)

WP7.2 K-Space Conference - The European Workshop on the Integration of Knowledge, Semantics and Digital Media Technology (EWIMT) (EWIMT06, Nov. 2006)

WP7.3 Towards a European cross and multi-media Society (M1-18): Aims to ensure the persistence of K-Space beyond EU funding.

WP7.4 Joint publications (M1-36): It will represent an essential mean to build a coherent and solid learning society. Joint publications will help to spread excellence outside the network and to enlarge the network audience. Identification of important international and well established conferences that are likely to accept a special session on K-Space topics will take place during the first three months of the project. Later activities include nomination of an organisation committee, selection of conferences and organisation of the special session (selection of technical committee, call for paper, reviewing process, financial support for students).

- **WP7.4.1** Special sessions in relevant conferences (M1-18)
- **WP7.4.2** Special issue in leading journals (M2-18)

WP7.5 Short courses and training programs (M1-18): The first sub-activities will focus on creation of K-Space tutorials from the existing education material amongst the partners for the first tutorial, and on creation of filmed seminars given in an institution of K-Space. These materials will be placed on the K-Space Web site and will be available to the rest of the network, both by streaming the seminar live (web-casting) and making it available as a download. Summer school will be prepared and organised (Program, funding scheme for students, prize policy ...). A creation of short courses for industry from existing education material amongst the partners will be undertaken. One sub-activity is dedicated to the harmonisation of high level education in Europe. This is a long term goal and will initially involve only a few of the partners. Ultimately, these actions will lead to a much stronger integration of doctoral programs between the universities of the network.

- **WP7.5.1** K-Space Tutorials (M3-18)
- **WP7.5.2** Web seminars (M3-18)
- **WP7.5.3** Summer school program (M1-12)
- **WP7.5.4** Short courses for industry (M3-18)
- **WP7.5.5** European Master/PhD program and short courses (M1-18)

WP7.6 Exhibitions and demonstrations (M1-18): Will consist in having an identifiable presence at important international meetings and exhibitions, such as IBC (International Broadcasting Convention).

WP7.7 Contribution to standards (M1-18): This activity aims at actively participating and contributing to ongoing international standardization initiatives. Active participation to relevant initiatives such those of ISO/IEC JTC1/SC29 WG 11 (MPEG) ,WG1 (JPEG) standard bodies, and as well as ones describing semantic web layer structure and ontologies.

WP7.8 Technology Transfer (M1-18): To facilitate this transfer, a forum of industry will be established. The

* Workpackage leader

forum of industry will allow to provide the academic network participants with feedbacks from current trends in Industry (Market, user requirements…). Such a forum will permit a fruitful interaction between the academic partners of the networks and the industry and will thus facilitate technology transfer. All members of the forum will be invited to a yearly workshop and will be asked to suggest new directions/strategy to augment K-Space impact and integration effort.

Deliverables

D7.1 (M2,4,..18) Bimonthly newsletter, (UEP)
D7.2 (M3) Web portal, (UEP)
D7.3 (M7) First K-Space tutorials, Web seminars and short courses for Industry, (DCU)
D7.4 (M7) First web seminar, (GET)
D7.5.(1,2,3) (M12,M24,M36) Proceedings of EWIMT, (K-Space Partner hosting EWIMT'06, '07, '08)
D7.6 (M12) First Yearly summer school, (GU)
D7.7 (M12) First Yearly report on the European integration of Master and doctoral programs, (KU)
D7.8 (M12) First Yearly report on Standardisation contributions, (TUB)
D7.9 (M14) First short course for industry, (EURECOM)

Internal deliverables

ID7.1 (M10) Report on special sessions in leading conferences, (GU)
ID7.2 (M12) Report on the viability of a scientific forum in knowledge-based multimedia analysis, (GET)
ID7.3 (M14) Technology transfer initiatives and feedback from Industry, (EURECOM)

Milestones and expected result

M7.1 (M2) First one-day meeting with the Industrial Advisory Board
M7.2 (M3) Agreement for K-Space special sessions at a major conference
M7.3 (M7) Web seminars encoded for streaming and download
M7.4 (M12) Second one-day meeting with the extended Industrial Advisory Board
M7.5 (M14) First short courses for industry (3 day session)
M7.6 (M18) Active participation to a major exhibition event

WP1		Start date or starting event:	M1
Consortium management			
Participant id	**1(QMUL)***		

Objectives

- To ensure that the objectives are clearly defined and understood
- To assign responsibilities clearly at activity and sub-activity level
- To define clear lines of communication among the participants.

Description of work

WP1.1 Management Charter (M1-18): Defines and sets up the practical mechanisms to implement the terms of the Consortium Agreement.

WP1.2 Communication with the EU Commission (M1-18): One staff member from each partner is appointed as administration contact to interface with the administration manager. For the production of the progress reports that will be ratified by the Network Executive Committee, the administration managers will rely on the expertise of the Network Executive Committee.

WP1.3 Financial Planning (M1-18): A detailed financial plan will be written by the administration executive, based on the outline financial plan of the project and the recommendations of the CO.

WP1.4 Accounting and Financial Audits (M1-18): It will ensure that financial audits as required by the EU are being implemented in the network. If needed the administration manager will use network funds for the auditing procedure.

WP1.5 Handling of Legal and Ethical Matters (M1-18): It will cover the way that partners behave with respect to each other according to the terms of the Consortium Agreement. It will deal with the liability of partners, partner withdrawal procedures, the settlement of disputes, the responsibilities of partners regarding accurate and timely reporting of difficulties, confidentiality, etc.

WP1.6 Concertation, Consensus and Clusters (M1-18): This task will identify potential for clustering and use diverse project activities to perform concerted actions with other networks and projects.

WP1.7 Overall Coordination of the Joint Activities of the Network (M1-18): The main activity and main task of the Network Executive Committee. The progress of individual actions and achievements in the corresponding activities will be supervised by the WP leaders who report to the Project Executive Committee. The Network coordinator (Chair of the NEC) will ensure that relevant information on NoE progress and status is being exchanged among the members of the Network Executive Committee. Using this information the Network Executive Committee can quickly identify if changes are needed and efficiently decide what corrections or new actions should be implemented.

WP1.8 Quality Assurance and Technical Auditing (M1-18): The Quality Assurance Committee will ensure that relevant technical activities are audited as required by the EU. All deliverables and internal action reports will undergo internal reviews. The outcome of the review and following discussions will be used to set new directions and corrections if required.

WP1.9 Gender and Social Issues (M1-18): The Administration Executive will use his/her close links to the administration contacts in order to ensure that gender and social issues policies are being implemented.

Deliverables

D1.1 (M6,12,18) Regular management and progress reports, (QMUL)
D1.2 (M12) Financial audit reports, (QMUL)
D1.3 (M12) Reports on technical audits and internal reports, (QMUL)
D1.4 (M14) Status report, (QMUL)

Internal deliverables

ID1.1 (M1,13) Yearly financial plan, (QMUL)
ID1.2 (M3) Management charter, (QMUL)

* Workpackage leader

B.9 Description of the resources necessary to implement the joint programme of activities

K-Space integrates 14 partners over 36 months, amounting to a total of **1594** staff months, to achieve all objectives stated in section B.1.

On the basis of the cost of researchers to be involved in K-Space, as provided by the Network partners, the economic dimension of the activities to be carried out under this project is estimated, in 2005 prices, at approximately 15 million Euros[8] over three years. This estimate is valid under the assumption that all the research staff given in Table 1 will dedicate 1/3 of their time to research and developments related to K-Space. It will not escape the reviewer's notice that the requested funding according to the rules of NoEs in FP6 is a fraction of the real economical dimension of the Network as estimated before. With a total of **85** full-time researchers and **70** doctoral students the requested funding for the proposed activities is 2 Million Euros a year, adding up to 6 Million Euros of requested funding over three years.

About **7%** of requested funding is for management, covering the activities in WP1. It should be noted that additional management activities will be carried out by the WP leaders, and in particular the leader of WP7 who will assist with strategic and communication management activities. Again, it will not escape the reviewer's notice that the management funding of such an enterprising project will exceed the 7% recommended Model Contract Cost Models document. K-Space partners have calculated that it is impossible to correctly manage a project of the size of K-Space without at least one professional full time Project Manager, the administrative executive described in section B7.1 and the network coordinator. Since it is expected that the management cost will exceed the **7%** allocated from the requested funding, the coordinating partner will assume the cost excess.

As appropriate for a project focusing on few key technological developments, the JRA of the network will require approximately **68**% of total awarded resources. These resources will be distributed among the research oriented WPs (WP3, WP4, WP5) and the technical workpackage devoted to the design and instantiation of the technical infrastructure required to enable integration activities to take place (WP6). This will ensure that the necessary support is in place in order to allow partners to collaborate effectively sharing resources and data. The remaining **25%** of requested resources will be used for integration and excellence spreading activities, WP2 and WP7.

The Network has approximately equal allocations of staff resources in WP3, WP4 and WP5. The K-Space partners have been keen to ensure that sufficient resources are allocated to exploitation and dissemination tasks, in order for the innovations realized in the project to be used and valued by Europe's industrial and research communities.

All K-Space partners have participated in developing the project staff and financial budget, and have extensively discussed intra and inter WP collaboration during preparation of this proposal, such that task responsibilities and dependencies are clearly defined. Detailed WP subtask breakdowns have already been prepared by WP leaders, ready to be converted into specific WP plans if K-Space is awarded a contract. Careful attention has been paid to the sufficient allocation of staff resources to each task and subtask, to ensure that the required progress can be achieved within the timescale needed to meet project milestones, such as integration of distributed tools over the K-Space framework to be put in place in WP6.

Dependencies within WP tasks and between WPs were the subject of much scrutiny during proposal preparation, leading to commitment of all partners to their responsibilities as shown in the Pert chart, Section B.8. The following tables show a detailed breakdown of Staff Months per partner and activity, as it planed in order to achieve all objectives and milestones of the Network and issue deliverables according to the detailed plan given in section B8.

The following table give a detailed breakdown of the personnel resources each partner bring to the Network and the corresponding allocation within the project Activities.

[8] The network recognise that this is a rough estimate. The given figure is rounded to the nearest 0.5M Euro.

Table 5 List of activities for the full duration of project

Activity	QMUL	KU	JRS	ITI	DCU	CWI	GET	INA	EURECOM	GU	DFKI	TUB	EPFL	UEP	Total participants
Integrating activities	7	7	6	4	10	11	10	4	9	8	9	11	9	9	114
WP2.1 Exchange of Academic Research Personnel	2	2	2	2	3	6	3	2	3	**3**	6	3	2	2	41
WP2.2 Industrial Placement of Research Personnel	2	2	2	1	2	2	3	1	3	1	1	1	2	**2**	25
WP2.3 Shared Teaching Resources	2	2			3	2	3		2	2	1	**5**	4	3	29
WP2.4 Dissemination to the Non Specialist Citizen	1	1	**1**	1	1	1	1	1	1	1	1	1	1	1	14
WP2.5 Monitoring and Evaluation of Integration Activities			1		**1**					1		1		1	5
Joint research programme	81	92	69	72	150	42	114	32	216	71	22	32	72	120	1185
WP3.1 Content Structuring	5		**12**		18	1	24	10	24	10					104
WP3.2 Moving 2D and 3D Object Segmentation and Indexing	5		8		**24**	1	15		54			5	24		136
WP3.3 Audio/Speech Processing and Text Analysis							**48**				2	15			65
WP3.4 Content Description	4	6	**12**	4	18	4	12	10	36	12	2	8	12		140
WP4.1 Specification of a Multimedia Ontology Infrastructure		**17**	1	12		6					2			22	60
WP4.2 Knowledge-assisted Multimedia Analysis		6	1	**24**	18	1		6	36				24		116
WP4.3 Knowledge-assisted Multimedia Reasoning and Annotation		6		**16**				2	24		2		4		54
WP4.4 Reasoning for Knowledge Extraction	10		6		18	1	9		30	**39**					113
WP4.5 Intelligent User Relevance Feedback	**20**					4				4					28
WP5.1 Knowledge Representation for Multimedia		18	6	4		6					2			25	61
WP5.2 Reference Framework for Distributed Semantic Management of Multimedia Metadata		**11**				4								4	19
WP5.3 Semantics-based Interaction with Multimedia	15	6	4		12	**8**		2		2	2				51
WP5.4 Knowledge Extraction from Complementary Sources	16	6	4								**6**			30	62
WP5.5 Semantic Descriptions of Multimedia Context		8	6	8		4								**26**	52
WP6.1 Distributed Research Environment Design	3	5	6	2	**36**	1	3	1	6	2	2	2	4	8	81
WP6.2 Research Resource Sharing	3	3	3	2	**6**	1	3	1	6	2	2	2	4	5	43

Spreading of excellence activities	9	22	18	9	21	14	17	8	17	12	20	18	28	39	252
WP7.1 Website and Electronic Newsletter	1	2	2	1	1	1	1	1	1	1	4	2	2	**13**	33
WP7.2 K-Space Conference - The European Workshop on the Integration of Knowledge, Semantics and Digital Media Technology (EWIMT)	**2**	2	2	2	3	1	2	1	2	2	3	2	2	5	31
WP7.3 Towards a Scientific Forum in Multimedia Knowledge Extraction and Analysis	1	2	2	1	1	1	3	1	3	2	**6**	1	2	2	28
WP7.4 Joint Publications	1	8	3	2	3	4	3	1	3	2	1	2	**2**	8	43
WP7.5 Short Courses and Training Programs	1	2	1	0	3	1	3	1	3	1	1	1	2	4	24
WP7.6 Exhibitions and Demonstrations	1	1	**4**	1	2	1	1	1	1	1	1	2	2	1	20
WP7.7 Contribution to Standards	1	3	1	1	6	4	1	1	1	1	2	**6**	12	3	43
WP7.8 Technology Transfer	1	2	3	1	2	1	3	1	3	2	2	2	4	3	30

Consortium management activities	27	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	42.6
WP1.1 Management Charter	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	1
WP1.2 Communication With the EU Commission	**2**	0	0	0	0	0	0	0	0	0	0	0	0	0	2
WP1.3 Financial Planning	**5**	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	7.6
WP1.4 Accounting and Financial Audits	**5**	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	7.6
WP1.5 Handling of Legal and Ethical Matters	**3**	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	5.6
WP1.6 Concertation, Consensus and Clusters	**4**	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	6.6
WP1.7 Overall Coordination of the Joint Activities of the Network	**4**	0	0	0	0	0	0	0	0	0	0	0	0	0	4
WP1.8 Quality Assurance and Technical Auditing	**2**	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	4.6
WP1.9 Gender and Social Issues	**1**	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	3.6

TOTAL	124	122.2	94.2	86.2	182.2	68.2	142.2	45.2	243.2	92.2	52.2	62.2	110.2	169.2	1594

B.10 Other Issues

B.10.1 Ethical issues

K-Space partners are aware of ethical and societal issues concerning privacy of users, trustworthy relationships in the whole value chain of content creation, management, processing, distribution, and consumption, as well as accessibility.

B.10.2 Privacy

In order to facilitate content processing according to user preferences and context of use, usage research teams will need to keep user data with the related metadata. For testing of developed techniques in realistic scenarios the user model will keep a history of use for individual users and automatically learn the personal preferences from this. This could raise privacy issues. Individual data stored in digital format, even if anonymous, are subject to privacy regulations. In principle, this implies that data storage is to be restricted to what is necessary, that users have to be notified of this fact, that users have a right to inspect what is stored about them, and that their data is not to be transmitted to third parties and used for purposes other than those covered by the relationship the user has entered to the owner of the data. In this context K-Space will observe European legal regulations concerning privacy. This is at a policy level, and will be monitored and reinforced by the K-Space Administration Office and its legal department. At the technical level reasonable technical measures concerning data security of personal data will be applied. For instance transmission of personal data over open communication channels will be done in encrypted form only.

B.10.3 Trustworthiness

This is another important issue in multimedia delivery. K-Space will take the necessary measures to foster trust of users in the technology developed. The Network will deal with the policy aspects of trust, and it will recommend and apply existing technology to achieve and ensure security and trustworthiness. Observing a line of prudent concern, K-Space will make sure that by means of operational guidelines and procedures all user-specific information will reside in the users' terminal equipment and will only be exchanged to configure, perhaps dynamically, the communication link to be established. From a research point of view K-Space will also deal with trust issues by performing research on multimedia data authentication and copyright protection as described in the JRA plan, Activity WP3.4.

B.10.4 Accessibility

K-Space partners are also very aware of accessibility issues generated when new technologies are introduced and therefore special care must be taken to avoid the creation of barriers that put people off the new technologies. For this reason one of the main dissemination goals of the Network is to allow the non specialist citizen access to the outputs of the technology that is being developed. The reason for this is to establish at an early stage what is interesting to the user, what is helpful to the user, e.g. with different literacy kills and languages, and conversely what may be technologically interesting but either confusing or not addressing features that user, i.e. viewer, listener, or traveller needs. This will provide feedback on the targeted user centred research and the tools and techniques that are given attention. If this can be achieved it will contribute the success of the research and have wide societal implications.

The accessibility issue is not only about serving the community of differently-abled users, but also applies more generally to "abled" users in a "disabled" environment, for example driving an automobile makes a user "partially sighted". Including knowledge about the expressivity of different modalities in which information is and can be expressed will contribute to enabling creating output presentations appropriate for different users - whether abled or disabled. Many proposals have been made for minimum standards for access, and many organisations encourage content creators to follow these standards. One of the opportunites of K-Space is to express the underlying semantics of these explicitly in terms of standard Semantic Web languages. Publicising K-Space research will be subject to available guidelines such as those laid in:

http://www.w3.org/WAI

http://www.w3.org/TR/WAI-WEBCONTENT

http://bobby.watchfire.com/bobby/html/en/index.jsp

http://www.stakes.fi/cost219/

Additionally, K-Space activities will give special attention to accessibility and usability problems, mainly for people with different levels of disability.

Whenever new developments will not be compatible with existing standards and recommendations, K-Space will engage in overcoming specific problems and difficulties aiming at guaranteeing equivalent levels of accessibility and usability. More specifically, this will be achieved by setting guidelines, design recommendations and dissemination of best practices. These concerns will be made in agreement with the standardisation efforts described in section B3.1.

The Network efforts to ensure accessibility to physically impaired people will aim at facilitating accessibility problems and reducing impact of physical disabilities on accessing the technologies produced by K-Space. These efforts include but are not limited to:

- Installing new plug-ins
- Defining good interfaces for other programs such as automatic voice-to-text converters
- Provide technical instructions and guidelines which reflect the procedural approach albeit the detailed technical aspects of resulting technologies.
- Expressing accessibility guidelines in Semantic Web languages so that these can be incorporated as rules in the generation of multimedia presentations within the project and used by others in explicit (Semantic) Web document processing beyond the timescales of the project.

B.11 Gender issues

B.11.1 Gender Action plan

The consortium has already commenced discussion relating to gender issues and embarked upon developing an orchestrated activity. Currently, the consortium has **27** female participants[9] constituting **18%** of the Network membership. This includes the leadership of activities across different WPs. A major barrier to wider participation of women is the low percentage of female researchers in related areas across Europe. K-Space could be instrumental in attracting more female researchers to the area and provide a gateway to increased participation of women in the multimedia research and industry. In this project gender issues should be addressed rather than being swept under the umbrella of equality. This will involve implementation of positive action to promote women participation in all stages and spheres of the project. A policy statement will be included in the consortium agreement, which outlines the steps that secure the implementation of positive action. These include extended efforts to employ researchers and engage female members of staff into the project. However, these will be undertaken without compromising equal opportunity principals incorporated within EU policy documents. Although K-Space partners are not in the position to significantly affect the socio-cultural reasons that originate the gender bias in technology-oriented schools, the consortium has planned a set of specific actions aimed at reducing the gender disproportion. The following is an action plan indicating actions and activities that will be developed to promote gender equality in all forms within the project. The plan will consist of the following:

- The K-Space Administration Office will make special efforts in order to be as gender-balanced as possible in the first place, and will monitor the impact of the NoE activities on gender balance and gender-related issues
- K-Space partners will initiate promotional initiatives to illustrate university curricula in high schools, with the specific goal of reducing gender bias in technical universities. Numerous actions will be initiated with the goal of transforming the stereotypes of computer innovators, such as remembering women pioneers; promoting women's study groups; having female tutors illustrate the most technical aspects of communications and new media; etc.
- K-Space partners will also organize specific events for triggering the interest of women. K-Space partners will liaise with the Industrial Advisory Board to organize all-day retreats off-site for women to discuss gender issues faced by women in the computer industry and within the company.
- The partners of this NoE will promote the creation of women's new media communication systems users group in order to provide women with a more comfortable environment to ask questions.
- System interfaces will be evaluated in terms of user preferences in order to account for gender peculiarities in person-machine interaction. In fact, research indicates that interaction with services and technology is strongly gender-dependent, therefore an increased participation of women as software and system interface designers will be pursued by K-Space partners.
- Specific initiatives will be initiated by the Partners of this NoE in order to make women welcome. Companies will employ women as technical support staff, or in other informed customer service roles, and encourage women to volunteer information to one another. Special initiatives will be promoted in order to approach a gender balance, such as women-only tutorials, information campaigns and rate subsidies.

The plan will try to abide by the Commission's threefold relationship between women and research, articulated around the following:

- women's participation in research to be encouraged both as scientists/technologists and within the evaluation, consultation and implementation processes
- research must address women's needs, as much as men's needs
- research must be carried out in such a way as to contribute to an enhanced understanding of gender issues.

To guarantee equality of opportunity and treatment between women and men in research a set of standards will be set and their implementation monitored. This will help protect women against all sorts of discrimination. This project will implement various technical cooperation projects and programmes to promote equality of opportunity and treatment for women and men. Women will participate in and benefit

[9] This figure includes **10** full time researchers and **17** PhD students

from technical cooperation activities in all areas of concern. Particular efforts will be made to ensure that gender issues are considered during all planning, designing and implementing of activities described in section B4. This plan includes the provision of advisory services through direct contacts and consultative missions coordinated by the K-Space Administration Office. This is seen to be one of the most effective means to implement equality of opportunity and treatment for men and women in research in the various technical fields. Assistance will be provided to the various groups involved to implement concrete measures for reducing discrimination and to formulate and revise practices to ensure equality. K-Space hopes to gather and analyse information on issues of concern to women scientists/researchers and gender equality in order to guide efforts to improve their status. This will be for use within the Network and the knowledge will be shared for implementation in other projects. Training at different levels is a major means of promoting equality of opportunity and treatment for men and women in research. Through education and capacity building, women can be better prepared to take up decision making positions in research as well as in employers' and workers' organisations. Here the Master courses offered by the different academic institutions in the consortium will be instrumental. Female graduated from these courses will be encouraged to pursue research carriers under the support of this project.

At JRS the project DIANA (supported by the Austrian Federal Ministry of Transport and INNOVATION programme FEMtech) is currently running and will provide concrete demands of men and women working in an R&D environment. Out of that, guidelines will be developed and implemented in order to guarantee improved awareness and better opportunities for men and women, taking into account their individual personal and family situations.

The project will also closely look at the developments and activities of the AOIFE. This stands for the Association of Institutions for Feminist Education and Research in Europe. Pronounced "eefa", it is named after the Gaelic Eve. The AOIFE is active in more than 80 institutions with programmes to overcome the gendered digital divide. They are a European association for Women's Studies based on institutional membership, linking institutions dedicated to initiating and supporting feminist education and research in Europe.

B.11.2 Gender issues

An analysis of Gender impact of the 5th Framework Programme comes to the following conclusions for IST:

"*The gender impact of the digital divide and its causes are interrelated with specific problems affecting women. For instance, the less-favourable socio-economic conditions that may prevent women from purchasing ICT equipment or having access to the Internet. Furthermore, women's lack of interest and computer skills and their own perception of ICT as not being relevant for their lives, may help to retain women on the wrong side of the digital divide. The unequal participation of women in the information society is currently reducing among users as consumers, but increasing among users as citizens and is particularly visible among users as workers in core ICT industries. A key factor found to have a strong bearing on the propensity of women to participate in the information society and make use of available technologies was the nature of the applications available and, more particularly, the content. Some forms of content are more appealing to women and will encourage use, whilst others are more appealing to men and so act to discourage female participation. Currently the content is male-dominated.*" Therefore, the consideration of females in K-Space is crucial in addressing wider societal issues.

In addition to this, the following gender issues are relevant for this project: statistically, women need more flexibility in working conditions, as more women than men commit strongly to their family needs and try to balance job needs against this. This applies especially when women bring up their children on their own. However, not only the "when and where" of working and consuming is a gender issue. The impact report mentions the growing gap between people who use information and communication technology and those who do not, and sees women at a disadvantage for several reasons. "For example, lone parenthood is one of the determinants regarding women's access to information technology. Lone parent families, which are mostly headed by women, lack financial means and opportunities to access and exploit the potential of the information society."

K-Space partners are strongly convinced that gender differences are fundamental organising features of life and society and, therefore, they should not just be accepted, but also treasured, as they have important implications in scientific knowledge, technological progress, service characterization and content development. The research areas covered by K-Space have significant impact on gender equality in terms of targeted technologies, applications and services. In turn, this induced gender bias impacts on the

development of new forms of communications and relationships between citizens and institutions throughout Europe. These issues will be tackled in this project by promoting affirmative action at the institutional level according to the Gender Action Plan.

Annex A: Detailed Consortium Description

Queen Mary, University of London (QMUL)

Queen Mary, University of London (QMUL), it is the third largest college of the federal University of London with proven reputation in project coordination and participation in large cooperative projects. It hosts of one of the leading groups in multimedia analysis and processing in the UK. The Multimedia&Vision Research Laboratory enjoys a distinguished standing for innovation and the use of imaging and multimedia techniques to real world applications, receiving direct funding from overseas organisations such as Nokia, Philips, Nortel, the Department of Defence and the EU. The Lab is led by Prof. Ebroul Izquierdo who has been involved in research and management of several large projects in Germany, the UK and the European Union.

Much of the lab's work has been in the context of European Union research projects, such as: ACTS MOMUSYS, Custom TV, SAMBITS, PANORAMA, IMPACT and MARINER; Esprit UNITE; Basic Research DRUMS; IST SHUFFLE and CRUMPET.

Initial work in the EU RACE project MAVT (1992-95) consisted of real-time DSP implementation of an audio-visual terminal communicating via DECT and UMTS radio interfaces. The ACTS project MOMUSYS (1995-98) focused on real-time DSP implementation of a multimedia terminal transmitting over ISDN-over-DECT, PSTN, Wireless LAN and UMTS network interfaces. An extension to this project developed a video conferencing system using MPEG4. QMUL was involved in the research on DSP technology for the multiplexor, adaptive system control, user interface and the parallel implementation of the Video Object based codec; as a result of this work a number of contributions were made to MPEG on adaptive control systems. In the IST project SAMBITS (2000-02) and SAVANT (2002-04) work has focused on the development of Multimedia Technology for off-line and real-time design of new interactive multimedia services containing MPEG-4 and MPEG-7 elements. The Lab was a main contributor in the LINK PROMETHEUS project on 3-D virtual studios with MPEG4 transmission to a 3-D receiver. Much of this research is relevant to this proposal.

The Lab coordinated the FP5 IST project BUSMAN (2002-2004) and was instrumental in the development of innovative techniques for metadata extraction from video content. This work contributed to the success of the BUSMAN project.

Currently, the Lab participates in the FP5 NoE SCHEMA and is one of the main contributors and steering member of the FP6 IP project aceMedia.

The group is involved in the MPEG-4/7/21 activities. It is also coordinating the European COST292 forum which has over 40 participant institutions from 25 different European countries.

Background work will be on multimedia communication, the design of complex networked systems, advanced techniques for scalable coding and streaming of multimedia, semiautomatic extraction of metadata from audiovisual content and multimedia system implementation.

Prof. Ebroul Izquierdo, PhD, MSc, CEng, SMIEEE, MIEE, MBMA is a Chair of Multimedia and Computer Vision and head of the Multimedia and Vision Lab at the Electronic Engineering Department, Queen Mary University of London.

Prof. Izquierdo received the Dr. Rerun Naturalium (PhD) from the Humboldt University, Berlin, Germany, in 1993 for a Thesis on the stability and numerical solution of algebraic-differential equations. From 1990 to 1992 he was a teaching assistant at the department of applied mathematics, Technical University Berlin. From 1993 to 1996 Dr. Izquierdo was with the Heinrich-Hertz Institute for Communication Technology (HHI), Berlin, Germany, as associated researcher. During this period he developed and implemented techniques for vision based cognition, specifically stereo vision, disparity and motion estimation, video compression, 3D modelling and immersive telepresence. From 1998 to 1999 Dr. Izquierdo was with the Department of Electronic Systems Engineering of the University of Essex as a senior research officer. He worked on re-search dealing with content-based coding, efficient indexing and retrieval of video, nonlinear diffusion models for image processing and automatic semantic annotation of visual information.

Since 1993, Dr. Izquierdo has been involved in research and management of projects in Germany, the UK and the EU. In the European project ACTS-PANORAMA, he developed techniques for disparity estimation and intermediate view synthesis. In 1995 the German national project on Video Compression and Presentation for Interactive Services resulted in a patent and several publications. The research conducted within the projects Vision-Like TV (HHI, Berlin) and Content-Based Recognition and Retrieval for

Multimedia Information (Digital-VCE, UK) also led to several IEE and IEEE publications. In 1999 Dr. Izquierdo was awarded a short term British Telecom fellowship which concluded with another patent and further publications.

Dr. Izquierdo was the UK representative of the EU Action Cost211 and currently coordinates the EU Action Cost292. He has also coordinated the EU IST project BUSMAN and represents QMUL in the European IST Network of Excellence SCHEMA and is a main contributor to the IST IP aceMedia.

Dr. Izquierdo is associate editor of the IEEE Transactions on Circuits and Systems for Video Technology and has served as guest editor of two special issues of the IEEE TCSVT. He is a Chartered Engineer, a senior member of the IEEE, the IEE and the British Machine Vision Association. He is member of the management committee of the Information Visualization Society, the programme committee of the IEEE conference on Information Visualization, the international program committee of EURASIP&IEEE conference on Video Processing and Multimedia Communication and the COST sponsored European Workshop on Image Analysis for Multimedia Interactive Services. Dr. Izquierdo has served as session chair and organiser of invited sessions at the International Telecommunications Symposium, SBT/IEEE (Sao Paulo, 1998), the SCI'2000 (Orlando 2000) and International Conference on Science and Technology for the Development, (Havana, 2001), the IEEE Information Visualization Conference (London 2000, 2001, 2002, 2003 and 2004), the International Conference on Video Processing and Multimedia Communication (Zadar 2001, 2002, 2003 and 2004) and the European Workshop on Image Analysis for Multimedia Interactive Services (Tampere 2001, Lisbon 2004). He has been the chair of the European Workshop on Image Analysis for Multimedia Interactive Services, London 2003 and the European Workshop for the integration of Knowledge, Semantics and Content, London 2004

He has published over 150 technical papers including chapters in books.

Dr. Alan Pearmain is a senior lecturer in the Department. He joined the department in 1979 after previously working at University College, Dublin and Brookhaven National Laboratory, New York. He has worked in several RACE and ACTS projects (RACE R-1083: PARASOL, RACE R-2083: MAVT - Mobile Audio Visual Terminal, ACTS AC-098 MoMuSys - Mobile Audio-Video Systems) and on RACE AC-360 CustomTV. He was workgroup leader for the hardware development workgroup in MoMuSys and is currently working in the IST project SAMBITS. He has published many papers and sections of books. Recent publications have been on Multimedia systems and VLSI design tools. He has BSc (Eng) and PhD degrees from Southampton University, England.

Dr. John Bigham is a Reader in the Department and heads the Intelligent Systems group, which carries out applied and basic research into a broad range of issues related to the deployment of agent technology in real-world applications. John has worked on a variety of EU-funded projects, including UNITE (Integration of Uncertain and Temporal reasoning) and DRUMS (Defeasible Reasoning and Uncertainty Management) within the ESPRIOT Programme. Under ACTS he has participated in GEMA, AIM and IMPACT and in the 5th Framework will be working on the IST Project SHUFFLE.

Koblenz University (KU) – (UKob - University of Koblenz-Landau - Institute for Computational Visualistics & Institute for Informatics)

Universitaet Koblenz-Landau (D) has four departments, one of them being the department for computer science; there are currently about 9,500 students subscribed at the university, about 1300 of whom study in the department of computer science. The computer science department comprises 20 professors. It has a track record of teaching and research in informatics for over 25 years offering studies in the areas of computer science, computer visualistics, business informatics and information management. The institute for computational visualistics (represented by Prof. Dr. Dietrich Paulus) and the institute for computer science (represented by Prof. Dr. Steffen Staab) will participate in K-Space.

The institute for computational visualistics includes 6 professors (Harbusch, Krause, Müller, Oppermann, Paulus, Priese). The institute has been founded in order to focus on the role of multimedia in teaching and research and offers very well-known studies in computational visualistics attracting students from a very wide geographical spread. In the institute, the research group in image understanding led by Prof. Paulus has focused on image understanding, active vision, medical image processing and object re-construction covering the research areas from low level image processing up to full applications in medicine. The institute of computational visualisitcs participates also in the network of excellence COGAIN – Communication by Gaze Interaction.

The institute for informatics includes 8 professors (Furbach, Beckert, Ebert, Rosendahl, Steigner, Zöbel, Staab, Lautenbach) teaching and researching in the core areas of computer science. In particular, there is intensive research in the areas of Semantic Web, knowledge-based systems and reasoning (Prof.s Beckert, Furbach, Staab). The Artificial Intelligence Research Group (AIRG) at the Institute for Computer Science collects more than ten years experience in building knowledge representation and automated reasoning systems. It is chaired together by Prof. Beckert and Prof. Furbach. Evaluations of publication activities showed that they are among the leading AI groups in Germany. The research group on information systems and the semantic web (ISWeb) has been founded by Prof. Staab in Fall 2004.

Dr. Dietrich Paulus is professor for image understanding. He studied computer science at the University of Erlangen-Nuremberg, where he received a Master's Degree (Diploma) and a PhD (Dr. rer. nat.). Before his current position, Prof. Paulus worked as researcher and project manager at the University of Erlangen, managing e.g. projects in the special research efforts of national science foundation (Sonderforschungsbereich 603) “model-based analysis and visualization of complex scenes and sensor data”. He is the author of over 50 reviewed publications and is currently dean in the department of computer science.

Dr. Steffen Staab is professor for databases and information systems in the institute for informatics of the University of Koblenz-Landau. He heads the research group on information systems and the semantic web (ISWeb), which is participating in the EU IST Integrated Projects aceMedia and Adaptive Servics Grid (ASG). Before his current position Prof. Staab studied at the University of Erlangen-Nuremberg, University of Pennsylvania, and University of Freiburg, where he received his prediploma, his M.S.E. and his Dr. rer. nat., respectively. He then did consulting at the Fraunhofer institute for industrial engineering (IAO) in Stuttgart and hold a position as project manager and lecturer at the University of Karlsruhe. Prof. Staab has a wide range of research interests including semantic web, text mining, ontologies, peer-to-peer and service management with semantic descriptions, which led to over 100 refereed publications and 7 books, including the recent Handbook on Ontologies. Recently, he coordinated the 5FP IST project “SWAP - Semantic Web and Peer-to-peer”.

Joanneum Research Forschungsgesellschaft mbH (JRS)

Joanneum Research is a non-profit technology centre, located in Graz, Austria, concentrating on applied R&D with a highly qualified staff of more than 380 people. The centre implements its know-how in all sectors of technology transfer and innovation. Its services include specifically-geared development tasks for small- and medium-sized companies, complex interdisciplinary national and international research assignments as well as tailored techno-economic consulting.

The Institute of Information Systems & Information Management (http://www.joanneum.at/iis) focuses on web based information systems and digital media. Since Framework IV, the Institute has participated in more than 30 EC funded projects. Past projects in the area of digital media concentrated on developing algorithms and systems for digital film restoration, content indexing and content-based retrieval. This resulted amongst other things in one of the worldwide leading film restoration applications being commercially available – DIAMANT (http://www.film-restoration.com).

Recent research activities covered the field of Semantic Web technologies in combination with audiovisual media objects, in particular ontology based applications using XTM topic maps and OWL respectively as instrument to model domain specific knowledge. This research was applied to the application areas of exhibition modelling and design (project Scalex) and new media genres (project NM2 ongoing).

Werner Haas is the head of the Institute of Information Systems & Information Management at JRS. He has a degree in Technical Physics from Graz University of Technology. He started to work as Assistant Professor at the Institute for Hydraulics at Graz University of Technology in the field of development of computer aided measurement system for hydraulic laboratory and numerical simulation of fluid flow. From 1977 until 1988 he worked at the technical software house in the field of research and development of FE models and (mostly international) consultancy with emphasis on the integration of CAD, FEM and pre- and postprocessing.

When he started to work with JRS in 1988 his main tasks were the coordination of information technology in the company and the supervision of a working group in the field of high-performance computing and computer graphics. Starting in 1993 as the head of the Institute of Information Systems & Information management at JRS he has been dealing with the following research areas: combination of classical information systems with communication technologies, computer simulation, visualisation and digital media;

focus on integrated telecom- and information technologies, specialisation on multimedia data exchange, digital technologies for audiovisual and print media, in particular for video and film, extension of activities into the field of educational multimedia with active participation in European Research Programmes (EUREKA, ESPRIT, Telematics, Educational MultiMedia, etc.). In addition, he has been working as evaluator and expert for ESPRIT in the areas of HPCN, MM, OMI and for thematic calls (educational multimedia, information access). He is member of national advisory boards and author of numerous studies.

Georg Thallinger was born in 1965 in Graz. After finishing high school he started to study Telematics in 1985. He received his M.Sc. in 1992 from the University of Technology, Graz. Since 1992 he is working at Joanneum Research first in the fields of scientific visualisation and software engineering. He specialises on digital media and IT/CT consulting for SMEs. He manages national and international projects in these fields. Georg is lecturer for Communication Technology at the University of Applied Science FH-Joanneum.

Werner Bailer studied Media Technology and Design at the University of Applied Sciences in Hagenberg (Upper Austria). He graduated in 2002 with a diploma thesis on "Motion Estimation and Segmentation for Film/Video Standards Conversion and Restoration". This work was performed at the Institute of Information Systems and Information Management at JOANNEUM RESEARCH, where he works since 2001 as a research engineer. His main research interests are algorithms for video content analysis and digital film restoration, metadata description of audiovisual content and system architectures of media processing systems.

Michael Hausenblas finished his study of Telematics at the Graz University of Technology. He wrote his master thesis "Semantic Representation and Query of Legal Norms" (see: http://www.lexit.at) which is a topic of his main research interest: "Semantic Web/Ontology Engineering in combination with digital media". Currently he is working on a dissertation in this area. After numerous - partly international - traineeships (Shell, Siemens, etc.) he started to work in September 2001 at the Institute of Information Systems & Information Management, where he is assigned to the Web-based information systems group.

Informatics and Telematics Institute (ITI)

ITI-CERTH was founded in 1998 as a non-profit organisation under the auspices of the General Secretarial of Research and Technology of Greece (GSRT), with its head office located in Thessaloniki, Greece. Since 10.3.2000 it has been a founding member of the Centre of Research and Technology Hellas (CERTH) also supervised by the GSRT.

The most important related areas of R&D activities performed by ITI-CERTH include: image and video analysis, multimedia indexing and retrieval, informational retrieval and knowledge discovery for semantic-web applications, intelligent human computer interaction and intelligent agents, MPEG-7 and MPEG-21 standards. The Thessaloniki-based Information Processing Laboratory (IPL) of ITI-CERTH is participating in more than 20 EC IST projects and 43 National projects, and is the co-coordinator of four EC IST projects. Over the last five years, the ITI research team has authored over 85 publications in scientific journals and over 185 presentations to international conferences. Its Athens-based Image, Video and Multimedia Systems Lab (IVML) of the National Technical University of Athens (NTUA) will also collaborate in the project. It has led more than 50 European and national projects in the last decade, has authored more than 80 publications in scientific journals and over 180 in international conferences in the multimedia and knowledge technologies field. For a complete list of research activities, R&D projects and publications, see http://www.iti.gr and http://image.ntua.gr.

ITI-CERTH, collaborating with IVML-NTUA, is participating in IST-FP6 Integrated Project aceMedia, targeting to extract and exploit meaning inherent to the content in order to automate annotation and to add functionality that makes it easier for all users to create, communicate, find, consume and reuse audiovisual content. It is leading “WP4: Ontology Infrastructure, Knowledge-Assisted Content Analysis, Semantic Reasoning and Intelligent Content Retrieval”, where it has developed expertise in designing multimedia ontologies and exploiting them in the analysis of multimedia content. This expertise will be leveraged, extended, and adapted to the requirements of BOEMIE.

The two groups are also jointly participating in the IST-FP6 NoE “Knowledge Web”, targeting to support the transition process of ontology technology from academia to industry and to strengthen the European industry and service providers in Semantic Web enabled E-work and E-commerce. Their main role is the extension of existing ontology languages and tools to support multimedia applications. They are also involved in Greek national R&D Training Network MULTI-MINE, targeting to create a core of institutions for education-training in all areas relating to knowledge discovery and management with emphasis on multimedia.

ITI-CERTH is leading the IST-FP5 NoE "SCHEMA: Network of Excellence in Content-Based Semantic Scene Analysis and Information Retrieval", aiming to bring together a critical mass of universities, research centres industrial partners and end users in order to improve the systematic exchange of information by the forging of links between partners. SCHEMA objectives include content-based multimedia analysis, semantic web technologies, access to the information using query structures that come naturally to human beings, copyright issues of multimedia, new methods for multimedia access and delivery, MPEG-7 and MPEG-21 standards, user interfaces and human factors.

IVML-NTUA is participating in the IST-FP6 Network of Excellence MUSCLE, led by the European Research Consortium for Informatics and Mathematics (ERCIM) and aiming to facilitate high-level access to multimedia databases by systematically incorporating machine learning into an integrated approach to multimedia data mining. It has also participated in the IST-FP5 project "FAETHON: Unified Intelligent Access to Heterogeneous Audiovisual Content", where research has been conducted on advanced access services to heterogeneous multimedia content characterized by semantic phrasing of the queries, unified handling and personalized response, based on semantic unification of multimedia content.

ITI-CERTH is also participating in the COST 292 "Semantic Multimodal Analysis of Digital Media" activity, with main objective to push forward the frontiers of current research on semantic analysis, inference and conceptualisation for high-level annotation and retrieval of digital content. To achieve this goal this action brings together leading European research teams working on knowledge assisted semantic analysis, unification, inference and conceptualisation for high-level recognition of digital content. In particular, the proposed integrative research seeks solutions to issues for which current approaches fail giving focused attention to two main aspects: semantic learning and inference and multimodal analysis.

Finally ITI-CERTH has participated in the former European COST 211 Action "Redundancy reduction techniques and content analysis for multimedia services" and has been involved, with a number of academic partners, in common research initiatives, exchange of information and joint software development in the area of multimedia coding, analysis and feature extraction and evaluation methodologies. This effort has resulted in the development and exchange of visual analysis software as part of the voluntary Qimera initiative (www.qimera.org) to produce a software test-bed for video object segmentation and tracking.

Prof. Michael Strintzis received the Diploma in Electrical Engineering from the National Technical University of Athens, Athens, Greece in 1967, and the M.A. and Ph.D. degrees in Electrical Engineering from Princeton University, Princeton, N.J. in 1969 and 1970, respectively. He then joined the Electrical Engineering Department at the University of Pittsburgh, Pittsburgh, Pa., where he served as Assistant (1970-1976) and Associate (1976-1980) Professor. Since 1980 he is Professor of Electrical and Computer Engineering at the University of Thessaloniki, and since 1999 Director of ITI-CERTH. Since 1999 he serves as an Associate Editor of the IEEE Trans. on Circuits and Systems for Video Technology. His current research interests include 2D and 3D Image Coding, Image Processing, Biomedical Signal and Image Processing and DVD and Internet data authentication and copy protection. In 1984, Dr. Strintzis was awarded one of the Centennial Medals of the IEEE.

Prof. Stefanos Kollias received the Diploma degree in Electrical Engineering from the National Technical University of Athens (NTUA) in 1979, the M.Sc degree in Communication Engineering from the University of Manchester (UMIST), U.K., in 1980, and the Ph.D degree in Signal Processing from the Computer Science Division of NTUA in 1984. In 1982 he received a ComSoc Scholarship from the IEEE Communications Society. Since 1986 he has been with the NTUA where he is currently a Professor. From 1987 to 1988, he was a Visiting Research Scientist in the Department of Electrical Engineering and the Center for Telecommunications Research, Columbia University, New York, U.S.A. He is currently the Director of the Image, Video and Multimedia Systems Laboratory. Prof. Kollias has led more than 50 European and national projects in the last decade, has co-authored more than 80 publications in scientific journals and over 180 presentations to international conferences in the multimedia and knowledge technologies field. His research interests include image processing and analysis, neural networks, image and video coding, and multimedia systems.

Dr. Ioannis Kompatsiaris received the Diploma degree in electrical engineering and the Ph.D. degree in 3-D model based image sequence coding from Aristotle University of Thessaloniki (AUTH), Thessaloniki, Greece in 1996 and 2001, respectively. He is a Senior Researcher (Researcher D') with the Informatics and Telematics Institute, Thessaloniki. Prior to his current position, he was a Leading Researcher on 2-D and 3-D Imaging at AUTH. His research interests include 2-D and 3-D monoscopic and multiview image sequence analysis and coding, semantic annotation of multimedia content, multimedia information retrieval and knowledge discovery, MPEG-4 and MPEG-7 standards. His involvement with those research areas has led to

the co-authoring of 2 book chapters, 13 papers in refereed journals and more than 40 papers in international conferences. He has served as a regular reviewer for a number of international journals and conferences. Since 1996, he has been involved in more than 13 projects in Greece, funded by the EC, and the Greek Ministry of Research and Technology. I. Kompatsiaris is an IEEE member, a member of the IEE Visual Information Engineering Technical Advisory Panel and a member of the Technical Chamber of Greece.

Dr. Yannis Avrithis received the Diploma degree in Electrical and Computer Engineering from the National Technical University of Athens (NTUA) in 1993, the M.Sc. degree in Electrical and Electronic Engineering (Communications and Signal Processing) from the Imperial College of Science, Technology and Medicine, London, U.K., in 1994, and the Ph.D. degree in Electrical and Computer Engineering from NTUA in 2001. He is currently a senior researcher at the Image, Video and Multimedia Systems Laboratory. His research interests include image / video analysis, segmentation and interpretation, knowledge-assisted video analysis, content-based and semantic indexing and retrieval, video summarization, and multimedia databases. He has been involved in 13 R&D projects, and has published 15 articles in international journals, books and standards, and 33 in international conferences in the above areas.

Dublin City University (DCU)

The Centre for Digital Video Processing (CDVP) at Dublin City University is a cross-disciplinary research centre which brings together researchers in video and image analysis, information retrieval and search, and interface design. Formed in 1997, it was awarded ‘‘University Designated Research Centre” status in 1999. CDVP’s mission is to research and develop techniques and tools to automatically analyse and index digital video information and allow content-based operations such as browsing, searching, alerting, filtering and summarisation. Its research philosophy is to incorporate basic and theoretical research into demonstrators --- the Fischlar systems --- that are deployed as working systems with real users. These systems, and others, help to focus CDVP research into useful and practical directions.

The CDVP is a co-ordinator and and participant in the annual TRECVid activity. TRECVid is an annual benchmarking of video analysis and content-based operations coordinated by the National Institute of Standards and Technology in the US. TRECVid is now in its fifth year and involves more than 60 research teams from across the world, most from outside the US. Alan Smeaton has been one of the two co-ordinators of TRECVid since it commenced in 2000 and CDVP is also a participant in the ARDA-funded construction of a "Large Scale Concept Ontology for Multimedia" (LSCOM).

The CDVP presently consists of 40 researchers including 7 Faculty, 7 postdoctoral researchers, 24 research students and further support people. CDVP has taken part in previous EU projects including the FP6 Integrated Project aceMedia and the FP5 SCHEMA Network of Excellence and the Cost292 initiative. CDVP have also been part of earlier EU projects including MoMuSys, DICEMAN, EuroGatherer, Cost211, SIMPR and the Mira Working Group. The CDVP participates as the Irish national representative in the ISO/IEC MPEG world-wide standardisation activity.

Prof. Alan Smeaton (CDVP Director) is Professor of Computing in the School of Computer Applications of DCU. He is Director of the Centre for Digital Video Processing, a cross-disciplinary research centre with 24 researchers which was awarded "University Designated Research Centre" status in a competitive process in 2000. Since 2001 he is scientific director of the TREC video track, an annual world-wide initiative to benchmark the effectiveness of information retrieval from digital video libraries coordinated by NIST and funded by the US Dept. of Commerce, and he has been involved in TREC since its inception in 1990. He is an Associate Editor of the ACM Transactions on Information Systems and of the Journal of Information Retrieval (Kluwer) and is a member of the Editorial Boards of Information Processing and Management and the Journal on Digital Libraries. He has published over 85 refereed papers/chapters, 3 books/proceedings, and has won significant grant income (ca €1.67 million) from national and international funding agencies, and from industry. Prof. Smeaton is a member of the DELOS (Network of Excellence in Digital Libraries, EU-IST), MIRA (Network of Excellence in Multimedia Information Retrieval, EU-IST) and TREC initiative in benchmarking of information retrieval techniques (National Institute for Standards and Technology, US) (see www.computing.dcu.ie/~asmeaton more information).

Dr. Noel E.O’Connor is a lecturer in the School of Electronic Engineering and a Principal Investigator (PI) in the Centre for Digital Video Processing (CDVP) at Dublin City University. Originally, his research was conducted in the field of image and video compression, but recently he has focused on audiovisual analysis for knowledge extraction for indexing of large archives. His research is funded under Science Foundation Ireland and Enterprise Ireland national programmes, EU framework projects and industry contracts. He is a member of the Technical Management Committee of the EU FP6 aceMedia Integrated Project, and a

member of the Technical Committee and Management Committee of the EU FP5 SCHEMA Network of Excellence. In the past he has worked on several EU ACTS projects, including MoMuSys, DICEMAN and KIMSAC. He is the Irish representative to the EU COST 292 action and has also been an Irish representative and Head of National Delegation to the world-wide ISO/IEC MPEG standards body. He is a member of the steering committee of the RINCE (Research Institute for Networks and Communications Engineering) national centre for excellence in information and communications technology, and of the SFI Adaptive Information Cluster. Since July 2000, he has generated over €3.5M in funding both individually and jointly with the other PIs in the CDVP. He is a reviewer for Signal Processing: Image Communication (Elsevier), IEEE Trans. on Circuits Systems and Video Technology, IEEE Trans. on Image Processing and is a Programme Committee member of a number of respected international conferences and workshops.

Dr. Noel Murphy is a Senior Lecturer in Electronic Engineering in DCU with 17 years of research experience in Computer Vision, Video Coding and Video Retrieval. He is a founding member and active researcher in the Centre for Digital Video Processing in DCU and a collaborator in the Research Institute in Networks and Communications Engineering, (RINCE, DCU). He is an Irish representative on the COST 211quat Management Committee. He has been involved in organising various national and international workshops and national conferences, including WIAMIS and IMVIP, and is a reviewer for a selection of international journals, including IEEE Transactions on Image Processing and IEE Proceedings on Vision, Image and Signal Processing. He is a member of the IEEE. In the period 2000 to date he has published 20 papers in refereed conference proceedings.

Dr. Sean Marlow is a Senior Lecturer in the School of Electronic Engineering at Dublin City University. His area of research includes object-based video compression, digital video navigation, and audio-visual analysis. He is a chartered member of the IEI. He has published 3 journal articles, and 33 papers in refereed conference proceedings. He is a reviewer for Signal Processing: Image Communication, published by Elsevier. He is an external examiner for research theses in TCD, UL and DIT. He is co-Director of the Visual Media Processing Group and the Centre for Digital Video Processing. He is DCU's representative on MIDAS Ireland, the Microelectronics Industry Design Association of Ireland. He is a member of Academic Council and was elected onto Academic Council Sanding Ctte in January, 2001.

Dr. Gareth Jones obtained a B.Eng in Electrical and Electronic Engineering from the University of Bristol in 1989 and a PhD examining the Application of Linguistic Models in Continuous Speech Recognition in 1994 from the same institution. From 1993-96 he was a member of the Speech, Vision and Robotics Group, Department of Engineering and Computer Laboratory, University of Cambridge, working as a Research Associate on the Video Mail Retrieval using Voice (VMR) project. From 1996-2003 he was a Lecturer in Media Computing in the Department of Computer Science at the University of Exeter. From 1997-98 he was a Toshiba Fellow and engineer at the Toshiba Corporation Research and Development Centre in Kawasaki, Japan. In 2002 he was a Visiting Scientist to the Informedia project at Carnegie Mellon University, U.S.A. and a JSPS Visiting Fellow at the National Institute of Informatics, Tokyo, Japan. In 2003 he was appointed as a Senior Lecturer in the School of Computing at Dublin City University.

Centrum voor Wiskunde en Informatica (CWI)

CWI is the Dutch national research institute for Mathematics and Computer Science. CWI is a private, non-profit organisation. Founded in 1946 (as Mathematisch Centrum), CWI aims at fostering mathematics and computer science research in The Netherlands. CWI receives a basic funding from the Netherlands Organization for Scientific Research NWO, amounting to about 70% of the institute's total income. The remaining 30% is obtained through national research programmes, international programmes and contract research commissioned by industry.

CWI's mission is twofold: to perform frontier research in mathematics and computer science, and to transfer new knowledge in these fields to society in general and trade and industry in particular. CWI's mission is realized by several means. In addition to the standard ways of disseminating scientific knowledge, for example through publications, presentations at conferences, organization of workshops and exchange of researchers, CWI actively pursues joint projects with external partners, provides consulting services and actively stimulates the creation of spin-off companies. A technology transfer event is organized annually to promote this side of CWI's activities. Also special efforts are made to make research results known to non-specialist circles, ranging from researchers in other disciplines to the public at large. CWI has many contacts with national organizations for applied research with wide experience in turning research results directly into practical applications. Its researchers are supported by state-of-the-art computing facilities and a library of national importance.

CWI has always been very successful in securing a considerable participation in European research programs (ESPRIT, ACTS, TELEMATICS, BRITE, TMR, IST and others) and has extensive experience in managing these international collaborative research efforts. CWI is also strongly embedded in Dutch university research: about twenty of its senior researchers hold part-time positions as university professors and several projects are carried out in cooperation with university research groups. Annually CWI hosts some 200 visiting scientists from abroad. CWI has a staff of 210 fte (full time equivalent), 160 of whom are scientific staff. CWI operates on

an annual budget of € 13M.

CWI's research is organized in research themes: Networks and Logic - Optimization and Programming, Adavanced Communication Networks, Stochastics, Signals and Images, Interactive Software Development and Renovation, Specification and Analysis of Embedded Systems, Coordination Languages, Evolutionary Systems and Applied Algorithms, Applied Analysis and Scientific Computing, Computing and Control (formerly Computational Fluid Dynamics), Nonlinear Dynamics and Control Systems, Standardization and Knowledge Transfer, Datamining and Knowledge Discovery, Multimedia and Human/Computer Interaction, Visualization, Quantum Computing and Advanced Systems Research.

Lynda Hardman (http://www.cwi.nl/~lynda/) heads the Multimedia and Human-Computer Interaction group at CWI and is part-time full professor at the Technical University of Eindhoven. She obtained her PhD from the University of Amsterdam on the modelling and authoring of hypermedia documents, having graduated in Mathematics and Physics from Glasgow University. During several years of working in the software industry she was the development manager for Guide - the first hypertext authoring system for personal computers (1986). She was a member of the W3C working group that developed the first SMIL recommendation. The research projects she currently leads focus on different aspects of the automated generation of hypermedia presentations, with emphasis on aspects of discourse and design and on underlying (Semantic) Web technologies. She is a member of the editorial board for the New Review of Hypermedia and Multimedia, was co-programme chair for ACM Hypertext in 2003 and has reviewed for the ACM Multimedia, ACM Hypertext and WWW conference series.

Frank Nack (http://www.cwi.nl/~nack/) is a senior researcher at CWI, currently working in the Multimedia and Human-Computer Interaction group. He obtained his Ph.D. with a dissertation on "The Application of Video Semantics and Theme Representation for Automated Film Editing," at Lancaster University, UK. The main thrust of his research is on the representation, retrieval and reuse of media in distributed hypermedia systems, educational hypermedia systems that enhance human communication and creativity, computational applications of media theory & semiotics, automated video editing, interactive storytelling, and computational humour theory. He has been a member of the MPEG-7 standardization group where he served as the editor of the Context and Objectives Document and the Requirements Document, and chaired the MPEG-7 DDL development group. He serves on the editorial board of IEEE Multimedia, where he edits the Media Impact column.

Jacco van Ossenbruggen (http://www.cwi.nl/~jrvosse/) is a senior researcher with the Multimedia and Human-Computer Interaction group at CWI. He obtained his Ph.D. in computer science from the Vrije Universiteit Amsterdam with a dissertation entitled "Processing Structured Hypermedia -- a Matter of Style". With a background in software engineering, his current interests include synchronized multimedia on the Semantic Web and the automatic generation of user-tailored hypermedia presentations. He was a member of the W3C SYMM Working Group that developed the SMIL 1.0 and SMIL 2.0 Recommendations. He is currently project manager of a large Dutch national research project, BRICKS. He reviews regularly for Web and Semantic Web conferences.

Groupe des Ecoles des Télécommunications (GET)

The "Ecole Nationale Supérieure des Télécommunications" (Télécom Paris – ENST) is one of the 6 GET graduate schools. Telecom Paris is a state of the art institution in the fields of technology and innovation and has four major missions that pay tribute to its pedagogical excellence and its international dimension. These missions include research, engineering studies, research-oriented study, and life-long learning. Signal and image processing, telecommunications and computer sciences are at the heart of GET research. This research encompasses information theory, coding, modulation, detection, compression, classification, speech recognition and synthesis, audio indexing, vision, biometry and software engineering, cognitive sciences, databases, data mining and natural languages.

GET conducts methodological and technological research in various fields of multimedia signal processing (3D geometric modelling, stochastic modelling, multiple data compression, selective compression, MPEG-4-compliant 3D mesh coding, MPEG-7 indexing,…). GET work on audio is also quite extensive: audio objects manipulation, sound scenes indexation and analysis, automatic music transcription, and communication and cognition that concerns modeling language and its cognitive links with images.

Among the other related activities, GET researchers are heavily involved in Graphical User Interfaces and information visualization and hypermedia, language processing, interactive Web, information sharing, databases and knowledge base research, thus leading to document structure and indexation and multi-modal human-machine interaction.

Concerning education, as well as in-depth studies in the latest technologies, students can take courses in economics, management or even entrepreneurial skills in response to the increased diversity in career prospects. Personal skills, management skills, the ability to work responsibly with powerful technologies in a multicultural context – these qualities form part of the expertise of the ENST engineers.

Companies in the ICT sectors of industry have a strategic need for R & D expertise. The ENST has developed a programme in response to this need. Post-graduate students may enter into research partnerships with industry in the context of pre-doctoral or doctoral studies. ENST is a member of the doctoral program EDITE that gathers several of the major Paris universities. Currently nearly 500 students are preparing a Ph.D. in the EDITE doctoral program and about 120 PhD. degrees are delivered each year. ENST also proposes excellent library facilities. The library contains mainly monographs, research and congress reports and thesis dissertations. About 15 000 bibliographical notes and 20 000 books are thus available. Scientific and specialised magazines, multidisciplinary and international press can be consulted on the spot. The school has taken out subscriptions to 500 periodicals and about 300 magazines. The library also proposes many electronic information sources (over 3000 journals and conferences can be accessed electronically from the campus network) including Academic ASAP, IEEE Xplore, JSTOR Business Collection, MathSciNet, ScienceDirect,, ScienceDirect Backfile - Business, Management & Accounting.

Gaël Richard received the State Engineering degree from the École Nationale Supérieure des Télécommunications (ENST), Paris, France, in 1990 and the Ph.D. degree from LIMSI-CNRS, University of Paris-XI, in 1994 in the area of speech synthesis. He received the Habilitation à Diriger des Recherches degree from the University of Paris XI in September 2001. After the completion of his Ph.D., he spent two years at the CAIP Center, Rutgers University, Piscataway, NJ, in the speech processing group of Prof. J. Flanagan, where he explored innovative approaches for speech production. Between 1997 and 2001, he successively worked for Matra Nortel Communications, Lernout and Hauspie and for Philips Consumer Comunications. In particular, he was the project manager of several large-scale European projects in the field of multimodal verification and speech processing. He joined the Department of Signal and Image Processing, GET-ENST, as an Associate Professor in the field of audio and multimedia signals processing. He is co-author of over 50 papers and inventor in a number of patents, he is also one of the expert of the European commission in the field of man/machine interfaces.

Institut National de l'Audiovisuel (INA)

INA, a public-owned industrial and commercial company, is involved in several aspects of the audiovisual industry; audio and video archiving, restoration and commercialisation; legal deposit of french audiovisual radio and television broadcastings; professional training; technical and socio-economical research; production research. INA is in charge of French Audiovisual Archives and a partner of the Radio and Television Broadcasters in France. About 950 persons work in the institution, in charge of Radio and TV Archives, professional training, research and experimental production, since 1975.

INA has been in charge of the Legal Deposit for national TV channels (public and private) and for public radio channels since 1995 (with more than 40 000 hours per year). Large amount of collections: 900 000 hours of radio since 1930 and 550 000 hours of television since 1949. Since a law was voted in 1992, radio and television programmes now fall within the compass of the legal deposit, this task having also been devoted to INA. Researchers, teachers and students may therefore have access to part of INA's databases. In this context, INA has acquired experience in the analysis of user-based approach and in the development of user-friendly interfaces for archive retrieval and consulting.

50 persons (including 10 PhD students) work in the Research and Experimentation Department, organised in three groups: audio-visual, musical research and publications.

INA was involved in several IST projects (BRAVA, ECHO, PRESTO) as well as other EU projects (AURORA, EURODELPHES, CAPMED), and has lead successfully BRAVA, EURODELPHES and CAPMED. INA is coordinating the current PRESTOSPACE integrated project

INA's Research Laboratory conducts projects on cloning and communication tools for network applications, automated film and video restoration system, and computer graphics. The Research Laboratory is involved since three years in audiovisual analysis and in semi-automatic and manual indexing of the programs as in metadata management systems. It carries out various research projects funded by the European Commission. For instance, INA was coordinator of the R&D AURORA project for archive digitised restoration, initiated in 1995.

The R&D teams have recently focused their interest on indexing issues of digitised video material, and are conducting or participating to several projects :

- DiVAN, an ESPRIT project, for building a distributed audiovisual archives network, with broadcasters RAI and ERT, laboratories INRIA and FORTH and industrials INTRACOM and TECMATH;
- DICEMAN, an ACTS project, for developing and testing distributed Internet content exchange using Mpeg7 and agent negotiations, with CSELT, KPN and IST, and IBM and TELTEC.
- EURODELPHES, as coordinator of this Telematics project, for developing an innovative hypermedia pedagogical environment for teaching and learning history in European secondary schools, with archives providers (RAI, SWR), publishers (GIUNTI, KLETT, NATHAN), industrials (AIS, DTAG, PONTON), and academic partners;
- OLIVE, a Language Engineering project, for automatic transcription of audio track, providing contents for indexing audiovisual programs, and multilingual retrieval system, with ARTE and NOB, LIMSI for speech recognition, TNO as leader and academic partners.

Dr. Vincent Brunie was born in 1969. He received a PhD Degree in Computer Science at Compiègne University in 1999 for his works on document management in medical hypertext systems. He has now research interest in the field of audiovisual document description and on multimedia document engineering. He has been in charge of projects management (Diceman and Agir) at the R&D department of INA. He is now at the head of the Description of Audiovisual Content research team.

Dr. Jean Carrive was born in 1967. He received a PhD Degree in Computer Science at Paris 6 University. The subject of the thesis was "Classification of Audiovisual Sequences" and has been done in collaboration with INA (2000). Since then he is in charge of research at the R&D Department of INA in the field of Description of Audiovisual Documents. He as been involved in several national and European projects (DiVAN, AGIR) and is now project manager of the French FERIA project.

Dr. Laurent Vinet, was born in 1961. He received a PhD degree in computer science and image analysis at Paris9 University /INRIA (1991). He his currently in charge of research in the area of contents analysis at INA since 1996 and his research interests include image analysis, video indexing and object oriented design. He has been involved in several European projects (Eurodelphes, Animation 2000).

Laurent Vinet has been researcher at Eclimed Company for 4 years where he developed medical images analysis systems.

Dr. Daniel Teruggi was born in 1952. He studied composition and piano in Argentina. In 1977 he came to France and studied at the Paris Conservatory (Conservatoire National Supérieur de Musique de Paris) in the department of Electroacoustic Composition and Musical Research. In 1981, he became member of the INA Groupe de Recherches Musicales (GRM) where he first was in charge of the pedagogy of digital systems for composers, and then became Artistic Director of the group. In 1997 he becomes Director of the GRM. In 1998 he obtained a PhD in Art and Technology in the Paris VIII University. He teaches Sound and Visual Arts, at the Paris I Sorbonne University. Since October 2001 he directs the Research and Experimentation Department in INA. He is director of a Seminar on new technology applied to Music at the Paris IV University.

Institut Eurécom (EURECOM)

Institut Eurecom was founded in 1991 by the Swiss Federal Institute of Technology of Lausanne (EPFL) and the Ecole Nationale Supérieure des Télécommunications (ENST) in Paris. In 1995, Politecnico di Torino and in 2001, University of Helsinky joined as academic partners.

Institut Eurecom is a graduate-level research school that offers a Master program in the area of Communication Systems. About 100 students at master level are accepted each year from 8 European

schools. Moreover, more than 45 PhD students are presently preparing their thesis work at the Institute where teaching and research are undertaken in three Departments:

- Corporate communications : Internet and scalability , Network security,
- Multimedia Communication : Multmedia Indexing and Filtering, Speech and video processing , Analysis, Watermarking, Biometrics, Affective computing,
- Mobile Communication : Digital signal processing for mobile communications, Information theory, Wireless networks protocols, Ad Hoc Mobile network, Software radio platform.

Institut Eurecom is located on the Technopole of Sophia Antipolis in the South of France. It is a GIE (Groupement d'Intérêt Economique), a consortium under French Law. Its industrial members are currently Bouygues Télécom, Cegetel, Fondation Hasler, France Télécom , Hitachi, Sharp, ST Microelectronics, Swisscom, Texas Instruments, Thales. Institut Eurecom is participating actively in several cooperative projects, both at the national and international levels.

Bernard Merialdo

Bernard Mérialdo was admitted in the Ecole Normale Supérieure (Maths section) in 1975. He received a Ph.D. in Computer Science from Paris 6 University in 1979 and an "Habilitation à Diriger des Recherches" from Paris 7 University in 1992. He first taught at the Faculty of Sciences in Rabat (Morocco). In 1981, he joined the IBM France Scientific Center in Paris, where he led several research projects on natural language processing and speech recognition using probabilistic models. From 1988 to 1990, he was a visiting scientist in the IBM T.J Watson Research Center in Yorktown Heights, N.Y. (USA). In 1992, he joined the Multimedia Communications Department of the Institut Eurécom. His current research topics are multimedia indexing and information filtering applications. He is a member of IEEE, ACM, associate editor for the IEEE Transaction on Multimedia, and was general chair for the ACM Multimedia 2002 conference. He is currently Head of the Multimedia Communications Departement at Eurecom, and Director of the CNRS FRE 2660.

Benoit Huet

Benoit Huet received his BSc degree in computer science and engineering from the Ecole Superieure de Technologie Electrique (Groupe ESIEE, France) in 1992. In 1993, he was awarded the MSc degree in Artificial Intelligence from the University of Westminster (UK) with distinction, where he then spent two years working as a research and teaching assistant. He received his DPhil degree in Computer Science from the University of York (UK) for his research on the topic of object recognition from large databases. He is currently working as a research and teaching assistant in the multimedia information processing group of the Institut Eurecom (France). He has published some 40 papers in journals, edited books and refereed conferences. His research interests include computer vision, content-based retrieval, multimedia data mining and indexing (still and/or moving images) and pattern recognition. Benoit Huet is a member of the IEEE, IEEE Computer Society, IEE and British Machine Vision Association.

University of Glasgow (GU)

The University of Glasgow dates from 1451, when the Scottish King James II persuaded Pope Nicholas V to grant a bull authorising the founding of a university in the city. Modelled on the University of Bologna, Glasgow was, and has remained, a University in the European tradition. In the seventeenth century, the University moved to its first permanent home on the High Street.

The University has 1643 academic staff, 821 research staff and 2945 support staff, grouped into 11 faculties containing 106 specialist departments between them. One of the larger specialist departments is the Department of Computing Science, with 37 full-time academic staff, which houses the Information Retrieval Group as one of its 5 research laboratories.

The IR Group in Glasgow have three senior academics, headed by Professor Keith van Rijsbergen; two post-doctoral research fellows; and 15 PhD students. It is involved in many projects at UK, EU and international levels and is recognised as a major player in information retrieval. Research interests include Football video segmentation, event detection and summarisation; Interactive and context sensitive image retrieval; Adaptive retrieval; Implicit feedback mechanisms; Multi-modal interfaces; Adaptive web search techniques; High performance search system; Link analysis; Probabilistic and language models and Quantum information models.

Professor C. J. van Rijsbergen is a Professor at the Department of Computing Science. His research in Information Retrieval covers both theoretical and experimental aspects. He has specified several theoretical models for IR and seen some of them from the specification and prototype stage through to production. He

was the prime contractor for the Esprit working group Mira (Esprit Working Group: 20039) concentrating on the evaluation of interactive retrieval systems and was involved in many European funded initiatives such as MINSTREL, KWICK, SHAPE, IDOMENEUS, MIRO, FERMI. He is a fellow of the Royal Society of Edinburgh, the Institution of Electrical Engineers, the British Computer Society and the ACM. His professional activities include editorial board member of many leading journals (Information Processing and Management, Information Systems, The Computer Journal, and Journal of Information Retrieval). He authored two classic books on information retrieval and co-authored a book entitled "Information Retrieval: Uncertainty and Logics". He was also the co-organiser of the first international SIGIR workshop on context and IR held in July 2004. He is a member of the ISTAG.

Dr Joemon M. Jose is a Senior Lecturer at the Department of Computer Science, at the University of Glasgow. For the academic year 2004-05, he is a visiting research scientist at the School of Computer Science at the Carnegie Mellon University, Pittsburgh. He has been an active researcher in information retrieval (IR) since 1993 and has published over 50 journal and conference articles in information retrieval. He is the principal investigator in an EPSRC project named ADAPT (Adaptive Search Models for Information Retrieval - EP/C004108/1). He was the principal investigator of a recently completed EPSRC research project named POW! (Personalisation of Web Searches through Ostension and Summarisation - GR/R74642/01). He currently holds an industrial case grant supported by the Sharp Laboratories of Europe Ltd and the EPSRC (GR/P02653/01). He is also a co-investigator of a framework VI supported integrated project called IP-RACINE. He is the recipient of a short term research fellowship (STRF 2003) from the BT Exact Laboratories. He, along with Prof. C. J. Van Rijsbergen, has secured ESF funding for a European workshop on Context Sensitive IR to be conducted in July 2005. He is one of the programme committee chair for the 3rd international workshop on adaptive multimedia retrieval which is collocated with the IJCAI 2005. He is a co-recipient of the best paper award at the INTERACT 2003 conference and in the past received the BCS-Informer prize for the best European IR student paper. Recently, Jose's research was on developing novel interactive techniques for textual and multimedia environments. Many strands of this work have attracted industrial attention (SHARP & BT). In the past, he has investigated and developed image retrieval techniques for semi-structured photographic collections. He has also investigated the issues involved in the evaluation of interactive retrieval systems.

German Research Centre for Artificial Intelligence, (DFKI)

The German Research Center for Artificial Intelligence Intelligence, founded in 1988, is one of the largest non-profit contract research institutes in the field of innovative software technology based on Artificial Intelligence (AI) methods. Research and development in language technology is carried out mainly at the Saarbrücken site in the LT

Lab, whose director, Prof. Hans Uszkoreit, also holds a chair in Computational Linguistics at the University of the Saarland., has accrued much experience by successful coordination of and participation in various EU research projects, from which OLIVE, POP-EYE, TWENTYONE, MUMIS are particularly relevant for K-Space, since they were exploring the use of various language technologies for indexing and accessing multimedia content material. The LT-Lab also plays an active role in standardization activities, like for example in the ISO TC37/SC4 committee on language resources management. A main contribution of DFKI will lie in the use of knowledge extracted from complementary (language) sources for supporting the automated semantic annotation of multimedia material.

Thierry Declerck (M.A. Philosophy, Brussels; M.A. Computer Linguistics, Tübingen; nationality: Belgian; Languages: French, German, English, Spanish) is a senior consultant in the DFKI Language Technology Lab. Before joining DFKI in 1996, he worked at the Institute of Natural Language Processing (IMS) in Stuttgart. At DFKI, he then worked on the BMBF-funded project PARADIME, in which a set of NLP tools was developed for supporting IE applications. He was later the responsible scientist for the EU FP5 project MUMIS. The last two years he was working at the University of Saarland, conducting 2 projects, one on a linguistic infrastructure for eContent and the other one, Esperonto, on the relation between NLP and Semantic Web, also investigating the status of the automatic text-based semantic annotation of pictures present in the web. Within Esperonto he was involved as affiliated member in the SCHEMA Network of Excellence in Content-Based Semantic Scene Analysis and Information Retrieval. Togetherwith Prof. Elisabth André (Univeristy of Augsburg) and Yiannis Kompatsiaris (ITI), he proposed a lecture on "NLP for Multimedia Applications" at the 16th European Summer School in Logic, Language and Information in Nancy (ESSLLI 2004). A new edition of this lecture will be held at ESSLLI 2005 (Edinburgh).

Melanie Siegel (Ph.D. in Linguistics, University of Bielefeld, nationality: German; languages: German, English, Japanese) was senior researcher at Saarland University, where she coordinated the EUProject DeepThought (IST- 2001-37836). She has experiences in Japanese linguistics, machine translation and grammar theory and implementation. She has been involved 8 years in the Verbmobil project at DFKI,contributing the implementation of Japanese syntax. Her main expertise

concerns hybrid and shallow methods for knowledge-intensive information extraction. In Deep Thought the relation of language-based information to other media in content delivery was an issue that will be more investigate in more scientific depth in K-Space.

Paul Buitelaar studied Computational Linguistics at Utrecht University, the Netherlands and Computer Science at Brandeis University, Waltham MA, USA (PhD 1998). He organized several international workshops on topics in lexical semantics, semantic annotation, ontology development and semantic web and has been an invited speaker at many panels and workshops in these areas. His main research interest is in Language Technology for Semantic-Based Information Access. At DFKI he has been working as a senior researcher and project leader on a number of EU and German funded projects and as a project coordinator of the EU/NSF funded project MuchMore on concept-based cross-lingual medical information retrieval (2000-2003). He was initiator and coordinator of a Special Interest Group on Language Technology in Ontology Development and Use within the EU funded thematic network OntoWeb (2001-2004) and is co-chair of the DFKI Competence Center Semantic Web.

Ecole Polytechnique Fédérale de Lausanne (EPFL)

Prof. Touradj Ebrahimi

Prof. Ebrahimi was born on July 30, 1965. He received his M.Sc. and Ph.D., both in Electrical Engineering, from the Swiss Federal Institute of Technology, Lausanne, Switzerland, in 1989 and 1992 respectively. From 1989 to 1992, he was a research assistant at the Signal Processing Laboratory of the Swiss Federal Institute of Technology (EPFL). During the summer 1990, he was a visiting researcher at the Signal and Image Processing Institute of the University of Southern California, Los Angeles, California. In 1993, he was a research engineer at the Corporate Research Laboratories of Sony Corporation in Tokyo, where he conducted research on advanced video compression techniques for storage applications. In 1994, he served as a research consultant at AT&T Bell Laboratories working on very low bitrate video coding.

He is currently a Titular Professor of Digital Imaging at the Signal Processing Laboratory of EPFL, where he is involved with various aspects of Digital Video and Multimedia applications and in charge of its Digital TV group.

In 1989, he was the recipient of the IEEE and Swiss national ASE award, in 2000 he was awarded the first price for the best paper appeared in IEEE Transactions on Consumer Electronics, and in 2001 he was recipient of two ISO awards for outstanding contributions to MPEG-4 and JPEG 2000. He is author or coauthor of over 100 papers and holds 10 patents.

Prof. Sabine Süsstrunk

Prof. Sabine Süsstrunk is Assistant Professor for Images and Visual Representation in the Audiovisual Communications Laboratory (LCAV), School of Information and Communication Sciences, at the Swiss Federal Institute of Technology (EPFL) in Lausanne, Switzerland. Her main research areas are in digital photography, color imaging, image quality metrics, and digital image archiving. From 1995-1999, she was the Principle Imaging Researcher at Corbis Corporation in Seattle, WA, USA. >From 1991-1995, she was a Visiting Assistant Professor in the School of Photographic Arts and Sciences at the Rochester Institute of Technology (RIT). She received a B.S. in Scientific Photography from the Swiss Federal Institute of Technology (ETHZ), and a M.Sc. in Graphic Arts Publishing from the Rochester Institute of Technology (RIT). She is currently pursuing a Ph.D. part time at the School of Computing Sciences, University of East Anglia (UEA), Norwich, UK. She is a member of ISO/TC42/WG18 and JWG20 – Electronic Photography standards groups, and was Vice-President of the Society of Imaging Science and Technology (IS&T) from 1999-2003.

Dr. Frédéric Dufaux

He received his M.Sc. in physics and Ph.D. in electrical engineering from the Swiss Federal Institute of Technology (EPFL), Lausanne, Switzerland, in 1990 and 1994 respectively. >From 1990 to 1994, he was a research assistant at the Signal Processing Laboratory at EPFL. During the summer 1992, he was a visiting researcher at the Advanced Video Technology Department of AT&T Bell Laboratories, Murray Hill, NJ. In 1994 and 1995, he was a Postdoctoral Fellow at the Media Laboratory of the Massachusetts Institute of

Technology, Cambridge, MA. From 1995 till 2001, he was a senior member of research staff at the Cambridge Research Laboratory of Compaq Computer Corp., Cambridge, MA. In 2001, he joined Genimedia SA, Lausanne, Switzerland, as a principal solutions architect. He is currently on the research staff at EPFL. He has been involved in the standardization of digital video and imaging technologies, representing Compaq on the MPEG committee, and Genimedia and EPFL on the JPEG committee. He is currently co-chairman of the JPEG2000 over wireless (JPWL) work item. His research interests include image and video coding, motion estimation, image and video analysis, computer vision, media security, and media transmission over wireless. He is the author or co-author of more than 40 research publications and holds 10 patents in the field of media technologies.

Dr. Yousri Abdeljaoued

He is currently a post-doc at EPFL. He received the MS degree in electrical engineering from the University of Hanover, Germany, in 1997, and the Ph.D. degree in electrical engineering from the Swiss Federal Institute of Technology, Lausanne, Switzerland, in 2001, for work on feature point extraction and tracking. In 2002, he joined Genimedia SA, Lausanne, a company focusing on perceptual quality of service for multimedia applications. His research activities include image/video processing, computer vision, and multimodal signal processing. He participated in the definition of the MPEG-7 standard and holds one patent.

University of Economics, Prague (UEP)

UEP (http://www.vse.cz) is the sixth largest Czech university, founded in 1953. It consists of six faculties. The Department of Information and Knowledge Engineering (DIKE) is organisational part of the Faculty of Informatics and Statistics, and was founded in 1990. DIKE has seven full-time members, several part-time members, and about 15 PhD students. Its main areas of research and education are knowledge technology, internet technology and full-text information systems.

In the area of knowledge technology, DIKE is recognised for its research in knowledge discovery in databases and knowledge modelling (esp. ontology engineering), with majority of applications in business and medicine. Funded partner in EC projects Medical Guideline Technology (4FP, 1998–2001), Enabling End-User Datawarehouse Mining (4FP, 2000-2003), Data Mining and Decision Support for Business Competitiveness (5FP, 2000–2002), Theory and Applications of Relational Structures as Knowledge Instruments (COST Action 274, 2001-2005) and Multilingual Content Aggregation System based on TRUST Search Engine (eContent, 2005-2006). Member of network projects such as MLnet (1994-1997), MLnet II (1999-2000), KDnet (2002–2004), EUNITE (2001–2004) OntoWeb (2001-2004), VISION (2002-2003) or Knowledge Web (2004-2006). DIKE developed its own approaches to association discovery (LISp-Miner http://lispminer.vse.cz), semantic document mark-up and transformation (Stepper, http://euromise.vse.cz/stepper-en), rule-based reasoning with uncertainty (NEST, http://lisp.vse.cz/NEST) or web information extraction (Rainbow, http://rainbow.vse.cz). In the areas of internet technology and full-text information systems, DIKE participated in several real-world projects aiming at development and maintenance of library information systems, e.g. the development of thesaurus for the Czech Parliament Library, or of the Union catalogue of the Czech Republic, at the Czech National Library. DIKE also developed original methods of natural language processing (machine translation, NL generation).

The group hosted several international events, such as the 9th European Conference on Machine Learning (ECML-97), the 3rd Conference on Principles and Practice of Knowledge Discovery in Databases (PKDD-99), or the 1st Symposium on Computerized Guidelines and Protocols (CGP-04); it will host the 15th International Conference on Knowledge Engineering and Knowledge Management (EKAW-06). It has leading role in the organisation of the annual Czecho-Slovak Knowledge Technology conference named ‚Znalosti' (‚Knowledge'), which started in 2001. Group members participate in the program committees of numerous international conferences such as ECML/PKDD, ISMIS, Discovery Science, Artificial Intelligence in Medicine Europe, Business Information Systems or Intelligent Information Processing and Web Mining.

Dr. Vojtěch Svátek (*1967). MSc in Information Science from the UEP in 1991, PhD in Informatics from the UEP in 1998. Teacher/researcher at the UEP since 1994. His main research domains are ontology engineering, semantic web, knowledge discovery in databases, and semantic analysis of textual knowledge. Contact person in three EC network projects, co-ordinator of two grants of the Czech Science Foundation. Organiser of several national and international scientific events, PC member of about 10 conferences. (Co-)author of more than 60 papers.

Dr. Petr Berka (*1959) obtained the PhD in Bionics from the Czech Technical University in 1991, and became Associate Professor in 1995. His research and educational activities concentrate on data mining and rule-based systems, with applications in medicine, finance and information retrieval. (Co)Chair of the Discovery Challenge at the ECML/PKDD series of conferences. Member of ECCAI and SIGKDD. (Co-)author of over 70 papers.

Dr. Jan Rauch (*1948) obtained the PhD in Mathematical Logics from the Mathematical Institute of Czechoslovak Academy of Sciences in 1987, and became Associate Professor in 1999. His interest is in the area of KDD, namely association discovery. Program Co-Chair of the PKDD-99 conference. (Co-)author of over 50 papers.

Dr. Vilém Sklenák (*1963). PhD in Information Systems from the UEP, in 1991. Head of DIKE since 1995. His main research domains are information retrieval systems, automated library systems, mark-up languages and computer typography. Co-ordinator of more than ten national grant projects in library information system development. Lead author of a monograph (2001) on Information and Knowledge Engineering, (co-)author of nine textbooks and about 40 other publications.

Petr Strossa (*1961). MSc in theoretical cybernetics, mathematical informatics and theory of systems from the Charles' University, Prague, in 1985, PhD from the UEP in 1992. His main research domain is computational linguistics and its application in information processing. He developed a software system for machine-aided translation of short expert texts from English to Czech, and has been responsible for the linguistic design of a system for reformulation of automatically generated association rules in various natural languages. Teacher/researcher at the UEP since 1985. Author of more than 70 publications.

Annex B: Ethical issues checklist

Table A. Proposers are requested to fill in the following table

Does your proposed research raise sensitive ethical questions related to:	**YES**	**NO**
Human beings		✓
Human biological samples		✓
Personal data (whether identified by name or not)		✓
Genetic information		✓
Animals		✓

If you answer "YES" to any of the above, please include in your proposal section B10.1 the more detailed version of Table A ("Crucial information") obtained from:
http://europa.eu.int/comm/research/science-society/ethics/rules_en.html
and also incorporate in section B.10.1 and in other appropriate parts of your proposal comments corresponding to the detailed instructions given in sections C-D at the above address

Table B. Proposers are requested to confirm that the proposed research does not involve:

- Research activity aimed at human cloning for reproductive purposes,
- Research activity intended to modify the genetic heritage of human beings which could make such changes heritable[10]
- Research activity intended to create human embryos solely for the purpose of research or for the purpose of stem cell procurement, including by means of somatic cell nuclear transfer.

	YES	**NO**
Confirmation : the proposed research involves none of the issues listed in Table B		✓

Further information on ethics requirements and rules are given at the science and ethics website at http://europa.eu.int/comm/research/science-society/ethics/ethics_en.html

[10] Research relating to cancer treatment of the gonads can be financed