

**INFORMATION SOCIETY TECHNOLOGIES  
(IST)  
PROGRAMME**



Project Number: IST-2001-32795

Project Title: Network of Excellence in Content-Based Semantic Scene Analysis and Information Retrieval

Deliverable Type: PU

Deliverable Number: 7.2

Contractual Date of Delivery: 30/04/2004 (month of the project: 35)

Actual Date of Delivery: 30/04/2004

Title of Deliverable: Final Evaluation Report

Work-Package contributing to the Deliverable: WP 7

Nature of the Deliverable: PU

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**Abstract:**

This document describes the results of a self-evaluation of the SCHEMA Network of Excellence. The evaluation was carried out by WP7 of the project. Initially, the size, scope and membership of the Network are considered. Thereafter, the specific activities that took place per project work package are considered. In each case, activities are evaluated considering two criteria: Whether activities were in fact taking place according to the project plan and the effectiveness of these activities in practice. On the basis of these considerations, conclusions are made that aim to help the members improve their work organisation and resource management in future Networks of Excellence or other European structures supporting and promoting research. In fact, there have been no major deviations from the project plan. Similarly, there have been no management issues or conflicts that have arisen and the project has run smoothly since its inception. Furthermore, extra activities and collaborations took place that were not foreseen at the outset of the project. In light of this evaluation, there is no doubt that the Network met its outstanding objectives.

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## 1. Introduction

This deliverable documents the final self evaluation report carried out by the SCHEMA Network of Excellence. This activity was carried out as part of WP7, in which all members were involved. The goal of WP7 was to constantly monitor the quality of the SCHEMA Network of Excellence (NoE) itself. The WP was responsible for the evaluation of the NoE activities in order to propose recommendations for improvement to the Steering Committee. However, being the final evaluation of the NoE, this document will not aim at proposing recommendations but rather at making some conclusions to help the members improve their work organisation and resource management in future Networks of Excellence or other European structures supporting and promoting research.

It should be noted that evaluation of technical systems was outside the scope of the work of WP7 and was the responsibility of WP2 and WP3.

As outlined in the NoE Technical Annex, the measures that were used to evaluate SCHEMA activities include:

- Tracking of successful submission of scientific papers to international refereed journals and conferences,
- Tracking of successful submission of scientific work to international standards,
- Tracking of accesses to the SCHEMA web server,
- Composition of a questionnaire available on the web server, which will enquire the satisfaction of visitors and collect their remarks for improvements,
- Deliverables acceptance and corrections/ remarks by the commission/reviewers,
- Mapping of how the individual SCHEMA results have contributed to the NoE objectives,
- Participation in and contributions to the NoE meetings and workshops,
- Mobility of researchers,
- Follow up activities (new R&D projects, etc),
- Unforeseen developments/activities.

All of these measures refer to specific SCHEMA activities as outlined in the Technical Annex and reflected in the NoE work plan. As such, it was decided to evaluate these measures via a review of SCHEMA activities within each WP since the NoE start date. In addition to evaluating either planned or unforeseen activities, this report also contains a discussion on the overall size and scope of the Network.

As such, after an initial discussion on the size and scope of the Network in Section 2, Section 3 evaluates SCHEMA activities within each WP in turn, as well as any unforeseen developments within the NoE that are described and evaluated in Section 3.7. Finally conclusions are made in Section 4.

When evaluating SCHEMA activities, a two stage process was employed. First, the activities that have taken place within a WP were reviewed and these were compared to the objectives of the WP as outlined in the Technical Annex. This is referred to as *Progress Evaluation* in this document and it evaluates whether or not activities are proceeding as outlined in the original project plan. Secondly, the impact of these activities is evaluated, and this is termed *Impact Evaluation* in this document. This considers the effectiveness (or otherwise) of the activities that have taken place. This serves to indicate whether or not the project was successfully completed.

## 2. Size and Scope of SCHEMA Network

### 2.1. Membership

SCHEMA membership consists of two types of members: Partners who were listed in the original NoE proposal, termed Full Members here, and those that have since joined SCHEMA, termed Affiliated Members. The main distinction between Full Members and Affiliated Members is that Full Members receive funding for SCHEMA activities as specified in the Technical Annex. In virtually all other respects, Affiliated Members enjoy all the privileges of Full Members – each has a presence on the SCHEMA web-site, each can submit/access documents in the SCHEMA library and Affiliated Members are encouraged to attend the NoE meetings (although there is no funding for this).

The status of the current status of SCHEMA membership is illustrated in the following tables:

SCHEMA Membership		
Full Members	Affiliated Members	Total
13	44	57

Categorization of SCHEMA Membership			
	Full Members	Affiliated Members	Total
Universities	7	16	23
Research Institutes	3	5	8
Small to Medium Enterprises	1	16	17
Industrials (non-SME)	2	5	7
Other	-	2	2

Geographic distribution of SCHEMA Membership			
<i>13 EU countries / 6 non EU countries</i>	Full Members	Affiliated Members	Total
Australia	-	2	2
Austria	-	2	2
Belgium	1	-	1
Bulgaria	-	1	1
China	-	1	1
Denmark	-	1	1
Finland	1	-	1
France	1	5	6
Germany	1	3	4
Greece	2	9	11
Ireland	1	-	1
Italy	3	5	8
Korea	-	1	1
Netherlands	-	2	2
Portugal	-	1	1
Spain	1	3	4

Geographic distribution of SCHEMA Membership			
<i>13 EU countries / 6 non EU countries</i>	<b>Full Members</b>	<b>Affiliated Members</b>	<b>Total</b>
Turkey	-	2	2
United Kingdom	2	4	6
United States	-	2	2
<b>EU partners</b>	<b>13</b>	<b>35</b>	<b>48</b>
<b>Non EU partners</b>	<b>-</b>	<b>9</b>	<b>9</b>

### 2.1.1. Evaluation of SCHEMA membership

It can be observed from the data above that SCHEMA membership has grown considerably since the first evaluation of the NoE. The number of Affiliated Members has more than doubled. The sustained effort of the NoE to reach out to the research community and the industrial world attracted many new partners, particularly small to medium enterprises, a priority partnership for SCHEMA.

The quality of both Full Members and Affiliated Members alike is excellent – as is evident from the partner profiles available on the official SCHEMA web site. The Network clearly represents a clustering of research expertise in the specific area targeted by the project.

Affiliated Members largely outnumber Full Members within the NoE. This is not surprising since, although there is no funding for Affiliated Members, there are significant benefits such as potential participation in SCHEMA technical activities (e.g., SCHEMA reference system) and access to relevant information via the SCHEMA library and the project email reflector (e.g., call for papers and special sessions of journals, research position notifications, etc).

Regarding the different categories of members, there is a clear emphasis on third level institutions and research institutions. Again this is not surprising since this kind of project is of particular interest to these kinds of partners as it provides mechanisms for student exchange, travel to conferences, networking, etc – activities that are typically either not of interest to industry, or alternatively funding for them is not an issue. Notwithstanding this preponderance of academic partners, industry is well represented within SCHEMA with 17 SME's and 7 large industrial partners represented as a result of an effort of communication targeted to this audience.

There is a good geographical distribution of SCHEMA members with a total of 13 EU countries represented. The NoE also has a worldwide visibility with 9 non-EU partners including Australia, Korea and the USA.

While it was clearly desirable to encourage Affiliated Members to join SCHEMA, it is also important that their presence was maximally exploited. In many cases several Affiliated Members have joined different SCHEMA meetings and technical activities.

## 2.2. Clustering activities

Since SCHEMA is a Network of Excellence, one of its primary objective is the clustering of researchers and research activities as opposed to building systems, running user trials or studies, or developing commercialisation plans/activities. In this section, these clustering activities are evaluated. Important considerations in this context are the amount of technical/scientific information exchange that occurs in the Network, the links the Network has formed into other similar or related research activities and, not least, the human dimension of the Network corresponding to the number of researchers involved in (or associated with) the project. Data reflecting these considerations is presented in the following tables. Since clustering activities outside SCHEMA is a specific objective of WP6, only activities within the network are presented in this section.

Technical contributions and discussions during SCHEMA meetings	
Scientific presentations	18
Technical communications & demonstrations	20
Industry presentations	9
Project management reports	47

Number of funded projects SCHEMA members are involved in		
EU	National	Other (e.g., industrial)
14	17	3

Number of researchers associated <sup>1</sup> with SCHEMA			
Principal Investigators	Postdoctoral Researchers	PhD Students	Other
24	5	24	12

<sup>1</sup> In this context, the expression “associated with SCHEMA” means researchers who have either been funded to travel to a conference to present a paper bearing the SCHEMA acknowledgement or who have participated in SCHEMA meetings or any other SCHEMA activities (e.g. short visits), or who have provided any input (ideas/discussion) to the SCHEMA project.

As is clear from the first table above, there is significant technical and scientific discussion being stimulated within the Network with a total of 38 scientific demonstrations or presentations having been made over the course of the 9 SCHEMA meetings (including the kick-off meeting). In addition, there have been 9 technical presentations from industry (one per meeting except during the kick-off meeting (0) and the meeting in Munich (2)) thereby allowing SCHEMA researchers to gain an industrial/commercial view of the research area as well to gain knowledge about state of the art commercial systems/applications. It should be

noted that the plan of having an invited industrial representative at each meeting has been adhered to.

Between meetings, scientific and technical discussion took place on the occasion of short visits and SCHEMA special sessions organised in 7 conferences, including a stronger involvement in WIAMIS 2003, 2004, and 2005.

Excluding this Network, SCHEMA partners are involved in 34 funded research projects in total, half of which are funded from EU sources, while the other half are funded from local (National or industrial) funding sources. This indicates that SCHEMA partners are heavily involved in research initiatives at both National and International level. Clearly, the SCHEMA partnership represents significant expertise in terms of tapping into various funding mechanisms.

### 3. SCHEMA Activities

#### 3.1. WP1: Project Management

##### 3.1.1. Overview

The main objectives of this WP were the co-ordination of all partners and the detection/handling of risks and organisational tasks. This WP controlled, monitored and improved the project objectives, timetables and project results. It reported the project progress and communicated to EC representatives.

##### 3.1.2. Implementation Evaluation

- (i) At the beginning of the project, a consortium agreement defining the IPR strategy within the consortium was drawn by modifying the Unified Consortium Agreement for FP5 RTD Projects according to the Thematic Networks contract, while taking under consideration additional knowledge protection issues discussed within the consortium. The agreed document was circulated to every partner for signing and this procedure was concluded on time.
- (ii) During each SCHEMA meeting there were scheduled meetings of both the Steering Committee (SC) and the Technical Committee (TC). Project progress from the management point of view was reported during each meeting. Since exploitation activities were expected during the third year of the project, the Exploitation Advisory Board (EAB) had to start meet regularly during the final year of the project.
- (iii) All reporting and monitoring activities have successfully taken place on time according to the Technical Annex. These include the management reports, progress reports, public reports and the annual reviews.
- (iv) As can be seen from the following detailed description of the WP's, most deliverables were prepared on time and made publicly available.
- (v) After the 1st annual review a more detailed procedure regarding effort reporting was implemented.
- (vi) SCHEMA used mailing lists and its web site for effective communication and dissemination.
- (vii) There were no conflicts within the consortium during the project.

Deliverables produced			
Title	Scheduled	Delivered	Partners involved
D1.1.1: Management Report 1	8/2002	8/2002	13
D1.1.2: Management Report 2	11/2002	11/2002	13
D1.1.3: Management Report 3	2/2003	2/2003	13

Deliverables produced			
Title	Scheduled	Delivered	Partners involved
D1.1.4: Management Report 4	5/2003	5/2003	13
D1.1.5: Management Report 5	9/2003	9/2003	13
D1.1.6: Management Report 6	12/2003	12/2003	13
D1.1.7: Management Report 7	3/2004	3/2004	13
D1.1.8: Management Report 8	6/2004	6/2004	13
D1.1.9: Management Report 9	9/2004	9/2004	13
D1.1.10: Management Report 10	12/2004	12/2004	13
D1.1.11: Management Report 11	3/2005	3/2005	13
D1.1.12: Management Report 12	6/2005	6/2005	13
D1.2.1: Progress Report 1	11/2002	11/2002	13
D1.2.2: Progress Report 2	5/2003	5/2003	13
D1.2.3: Progress Report 3	12/2003	12/2003	13
D1.2.4: Progress Report 4	6/2004	6/2004	13
D1.2.5: Progress Report 5	12/2004	12/2004	13
D1.2.6: Progress Report 6	6/2005	6/2005	13
D1.3.1: Schema Annual Report 2002	11/2002	11/2002	1
D1.3.2: Schema Annual Report 2003	11/2003	11/2003	1
D1.3.3: Schema Annual Report 2004	11/2004	11/2004	1

### 3.1.3. Impact Evaluation

Management activities have helped to meet the project objectives in a timely manner and at the same time report the progress to the EC. Given that effective and easily maintained management structure and processes for the project were rapidly put in place, project management should have focused on exploitation and dissemination activities including SME participation during the last year of the project. Although an effort was made in that sense, as is shown by the strong increase of the number of SME Affiliated Members, the project might have been less effective than expected concerning this aspect, as is shown by the delay in producing deliverables D6.2 Market Study and D6.3 Common Exploitation Plan.

## **3.2. WP2: State of the art, evaluation and user system requirements**

### **3.2.1. Overview**

The objectives of this WP included collecting information about other relevant projects, systems and publications, identifying user and system requirements and defining evaluation criteria for same. Each of these activities is evaluated separately in the following.

### **3.2.2. Implementation Evaluation**

- (i) A significant amount of information was collected regarding relevant projects, systems, products, publications, web sites, conferences and exhibitions relating to content-based analysis, indexing and retrieval. This information was collected into a substantial state of the art technical report that constitutes deliverable 2.1. This activity was carried out at the start of the project as one of the very initial tasks. The associated deliverable was delivered ahead of schedule. The review committee noted the high quality of this document and suggested that an update version be provided by the project. A 2-stage work plan involving most of the Full Members was proposed by the partner responsible for this deliverable. The final version, deliverable 2.1 release 4, was recently released.
- (ii) User and systems requirements of relevant systems and applications were collected, with special consideration of commercial systems and this was documented in deliverable D2.2 that was delivered on schedule according to the project plan.
- (iii) Similarly, suitable evaluation criteria were defined and specified in deliverable D2.3 that was also delivered on schedule. The TRECVID initiative was considered an excellent framework to evaluate the achievements of the project in content-based indexing and retrieval. Indeed, it offers an evaluation based on ground truth and competition with other participants. A timetable was established to prepare for the participation to the 2004 edition of TRECVID. SCHEMA registered as a single entity and performed very honourably. The project had the opportunity to give an oral presentation and a demo during the workshop following the competition and dedicated to it, which is quite rare for a first-time participant. It should be noted that two members of the project also participated independently to TRECVID. It was also their first participation. Along these lines, an evaluation of the different segmentation algorithms contributed by the members was recently launched. The goal is not to evaluate the performances of an algorithm in terms of segmentation accuracy but rather in terms of the efficiency of the content-based indexing and retrieval processing chain it is part of.
- (iv) The final activity of this WP – to define and solve the IPR related issues and prepare a model IPR agreement – took place as a management activity with the Consortium Agreement preparation as described in WP1.

Considering, the timely submission of all deliverables associated with this WP, and the number of partners involved in this process, as outlined in the table below, it is clear that all the activities in this WP have run as planned.

Deliverables produced			
Title	Scheduled	Delivered	Partners involved
D2.1: State of the art in content-based analysis, indexing and retrieval	09/30/2002	09/20/2002	5
D2.2: User and systems requirements	03/2003	03/2003	4
D2.3: Evaluation criteria and evaluation report	03/2003	03/2003	2
D2.1 (Release 4): State of the art in content-based analysis, indexing and retrieval	-	02/11/2005	9

### 3.2.3. Impact Evaluation

The activities of this WP have run to schedule, have included many partners and have been successful. However, since this WP targets documenting the state of the art and tracking user requirements, both of which being subject to rapid changes, it was suggested in the first evaluation report that deliverables 2.1 and 2.2 be updated before the end of the project. Actually, if an update of the state of the art appeared unquestionably necessary, it turned out that there are still important features requiring some improvement before working on identifying more specific user requirements.

## 3.3. WP3: Reference system design

### 3.3.1. Overview

The objective of this WP was to design a reference system for content-based analysis, representation, indexing and retrieval. The system should:

- Include all requirements from WP2,
- Focus on user needs and accessibility (data accessible to all),
- Follow a distributed and module-based approach, where different modules can be substituted from different partners,
- Include web-based access,
- Take into account current achievements in the MPEG-7 and MPEG-21 standards,
- Define interfaces between different modules using state-of-the-art technologies,
- Include technologies for user-interfaces, databases access and management,
- Target specific applications.

### 3.3.2. Implementation Evaluation

Four versions of the Schema Reference System have been developed (SchemaRS, SchemaXM, SchemaTREC, SchemaMPA) to address the objectives of WP2. They all:

- (i) Emphasize on user accessibility to the data by employing a user-friendly graphical user interface (GUI) that facilitates the use of the Reference System by inexperienced users,
- (ii) Follow a distributed and module-based approach, where different modules are contributed by different partners. The contributed image segmentation modules are:
  - Pseudo Flat Zone Loop (PFZL), contributed by Munich University of Technology - Institute for Integrated Circuits,
  - Modified Recursive Shortest Spanning Tree (RSST), contributed by Dublin City University,
  - K-Means-with-Connectivity-Constraint (KMCC), contributed by Centre of Research & Technology - Hellas / Informatics and Telematics Institute,
  - Expectation Maximization (EM) in a 6D colour/texture space, contributed by Queen Mary, University of London,
  - Watershed Segmentation and Rag Minimax (WSRM), contributed by the Electronics Laboratory of the University of Patras (Affiliated Member),
  - Syntactic segmentation, contributed by the Technical University of Catalonia (UPC).
- (iv) Are based on web technologies (PHP) and allow web-based access (<http://media.iti.gr/SchemaRS/systems/rs/index.html>, <http://media.iti.gr/SchemaRS/systems/xm/index.html>, SchemaTREC is currently not publicly available),
- (v) Rely on technologies for database access and management (e.g. MySQL RDBMS),
- (vi) Target the specific application of content-based image retrieval using the Query-by-Example paradigm.

The main difference between the first two versions of the Reference System is the employed indexing and retrieval subsystem. The first version employs a set of proprietary descriptors characterizing the colour, position, size and shape of each image region (linearised colour histograms in the RGB colour space, normalised region position in the image, normalised area, eccentricity, orientation), while using a simple mechanism based on the Euclidean distance for matching. As opposed to this, the second version of the Reference System further addresses the requirement for taking into account current achievements in the MPEG-7 standard by replacing the proprietary descriptors and the Euclidean-distance-based matching with a set of standardized MPEG-7 Descriptors (Colour Layout, Colour Structure, Dominant Colour, Scalable Colour, Edge Histogram, Homogeneous Texture, Contour Shape, Region Shape) and their corresponding matching functions. To this end, the MPEG-7 eXperimentation Model (MPEG-7 XM) software is employed for extracting the MPEG-7 descriptors and for realizing search and retrieval based on them.

In its third version, the Reference System was extended to also deal with video by defining not only the employed region descriptors, but also two motion descriptors as well. The extended Reference System was used for the participation of SCHEMA to TRECVID. Actually, in this

context, a text-based query functionality was also added to be used by itself (the Schema-Text application) or in conjunction with the image and video modules.

Motivated by the will to combine the SCHEMA Reference System with image collections much larger than the 2000-image subset of the Corel gallery originally used, a version of the System based on an image database contributed by the MPA was developed, namely SchemaMPA. The purpose was to test and improve the System in order to reduce the search and retrieval time in a real-world, potentially commercial situation. The MPA image database is composed of 14000+ high-resolution news-related images textually annotated in Greek. A subset of 7000 images is currently used. Similarly to SchemaTREC, SchemaMPA allows to combine visual and textual cues to perform a query.

Alinari also contributed a 20000-image database fully annotated, either reflecting the content or the origin of the images. The integration of this database into the Reference System is done in parallel with the development of a new web interface: <http://schema.alinari.it/>

Aside from evaluating the efficiency of the System in terms of processing time, the partners also evaluated the quality of retrieval depending on which segmentation algorithm was used to determine the regions to compute the MPEG-7 visual descriptors on. Indeed, there are 6 segmentation algorithms that were developed by partners. This evaluation, coordinated by ITI, involved most of the partners. Pre-defined retrieval tasks were performed by different operators (Schema partners) on categorized images. The efficiency of a specific segmentation algorithm was related to the relevance of the retrieved images. The results of this study were presented at the 72nd MPEG meeting in Korea where the community showed much interest for it.

SCHEMA is planning to produce a publicly available version of the SCHEMA Reference System for download and installation. This will allow the Reference System to be used for evaluation and comparison purposes or as a standalone application for visual content-based and retrieval. To this end, ITI has been working closely with MPA in order to solve license agreement issues as well as to provide a friendly and efficient installation software and procedure. While working as a developer, MPA is also interested in this task as a future end-user.

### **3.3.3. Impact Evaluation**

The activities of this WP have included several partners (module contributions, etc.) and have taken advantage of recent progress on standardization activities (MPEG-7, MPEG-7 XM). As a consequence, the Reference System became mature enough to give SCHEMA the opportunity to participate to the TRECVID 2004 challenge. More importantly, it gives research institutions and organisations the opportunity to take the system as a test-bed and a common dataset for the evaluation and comparison of different modules and interfaces within the content-based indexing and retrieval context. An effort to propose a user-friendly installation procedure will be made before the end of the project.

### 3.4. WP4: Contribution to standards

#### 3.4.1. Overview

This WP was responsible for establishing and maintaining a communication flow between the Network of Excellence group and the relevant standardization bodies. To this end:

- SCHEMA representatives had to attend the MPEG meetings and inform all members about the current status,
- The SCHEMA network had to prepare contributions to the various calls of the standards activities and make all results available to the MPEG group.

#### 3.4.2. Implementation Evaluation

The SCHEMA proposal document identified MPEG-7 and MPEG-21 standards activities as strongly related to the research objectives of SCHEMA. This WP was responsible for establishing and maintaining a communication flow between the Network of Excellence group and the relevant standardization bodies, with two of the partners, at first, identified as contributors to the standards and a conduit for information flow in both directions. In terms of implementation of this WP, one would expect to see attendance by these two partners at a significant proportion of the relevant standards meetings, dissemination of reports of these meetings using the NoE facilities, and inputs to the standardization activities arising from NoE activities. In the second half of the project, four other partners showed interest in, and effectively contributed to, MPEG activities.

Deliverables produced			
Title	Scheduled	Delivered	Partners involved
D4.1: Contributions to Standards - First report	09/30/2003	10/30/2003	3
D4.2: Contributions to Standards - Final report	03/30/2005	03/01/2005	5

Deliverable D4.1 describes the six MPEG meetings held during the lifetime of the NoE up to the deliverable release date, which were all attended by one of the SCHEMA partners. Deliverable D4.2 also describes the seven MPEG meetings held between the previous deliverable release date and the end of the project. However, as opposed to the previous period, a more focused strategy was adopted: Four of these meetings were attended by several partners while the outputs of the three other meetings were closely followed. Although it is hard to measure yet, it probably contributed to give the SCHEMA activities a stronger impact on the MPEG community.

The dissemination of MPEG activities and information to SCHEMA happened through inputs to the Technical Committee, inputs to the NoE website and the above deliverable documents. The first type of input from SCHEMA to the MPEG activities was by way of an agreed contribution to evaluation of usability of MPEG-7 reference software. In this sense, WP4 was closely related

to WP3 since SCHEMA contributed to MPEG-7 standard by integrating the MPEG-7 XM software into the WP3 Reference System (referred to as SchemaXM) and by providing usability feedback. SCHEMA prepared a joint contribution to the standards community in terms of feedback regarding the usability of MPEG-7 part 6 (reference software). The contribution addressed the MPEG Video Group and was presented during the MPEG Meeting held in Munich in March 2004. Since then, the SCHEMA activities on MPEG standards intensified and gained in diversity. Overall, SCHEMA made 21 contributions during MPEG meetings. Within the framework of the project Reference System, the MPEG-7 visual descriptors were enriched with an indexing structure allowing handling large media collection. The indexing problem was further studied by proposing an automatic categorization into predefined semantic classes as part of the MPEG-7 Visual Core Experiment-2. In terms of retrieval, the influence of the segmentation algorithm used (6 algorithms are available in the Reference System) to determine the regions to compute the MPEG-7 visual descriptors on was investigated. It represents an evaluation of the segmentation algorithms of the SCHEMA Reference System based on retrieval performances as opposed to segmentation quality. This activity, coordinated by ITI, involved most of the partners. Pre-defined retrieval tasks were performed by different operators (Schema partners) on categorized images, including 2000 images of the MPEG-7 VCE image database contributed by MPEG for this particular study. The efficiency of a specific segmentation algorithm was related to the relevance of the retrieved images. The results were presented at the 72nd MPEG meeting in Korea where the community showed much interest for this study.

Contributions were made on aspects of MPEG standards not directly linked to the SCHEMA Reference System. They include Free Viewpoint Video, scalable video coding (including texture coding) for MPEG-21, and Symbolic Music Representation. Other unexpected activities were recently discussed in MPEG meetings. First, the use of the Reference System for art image retrieval was studied. This diversity of possible applications of the Reference System is undoubtedly a sign of its good health and good opinion in the community. At longer term, the Reference System, as a retrieval and delivery system over the Internet, could be considered as a possible test platform for new technologies based on the upcoming Multimedia Application Formats (MAFs) lately introduced by MPEG. The MAFs intend to provide a common framework for the delivery of elements of different MPEG formats over a network. Finally, in the 3D Audio-Visual ad-hoc group, SCHEMA presented and discussed its views about 3D descriptors for indexing and retrieval, including 3D depth, camera calibration, and multiple view management.

Two partners in the NoE clearly made active contributions to the JPEG2000 standard by developing and improving a standard-related software, OpenJPEG (<http://www.openjpeg.org/>). The dissemination of JPEG activities and information to the NoE happened through inputs to the Technical Committee, inputs to the SCHEMA website and the above deliverable documents.

A recent outcome of the participation of SCHEMA to TRECVID 2004 is its invitation by the National Institute of Standards and Technology (NIST) to give a presentation at the Joint MPEG/JPSearch sessions held during the 71st MPEG Meeting in Hong Kong. This presentation was given by ITI.

The table below summarises the standards-related SCHEMA contributions:

Standard Body	Standards Activity	No. Contributions	Type of Contribution	Partners involved
MPEG	MPEG-7 MPEG-21	19	MPEG-7 XM MPEG-21 SVC	6

Standard Body	Standards Activity	No. Contributions	Type of Contribution	Partners involved
JPEG	JPEG 2000	1	OpenJPEG and OpenWatermark. JPEG 2000 part 1	2
JPSearch	JPSearch	1	-	2

### 3.4.3. Impact Evaluation

In the MPEG area, there was a significant activity attributable solely to the existence of the NoE. In the JPEG area, SCHEMA clearly supported the continuation of an existing important activity. The NoE had the opportunity to attend the first meeting of new standardization activity, JPSearch. It gives a unique chance to the partners involved to participate from the beginning, and beyond SCHEMA, to this activity.

## 3.5. WP5: Researchers mobility

### 3.5.1. Overview

A crucial role of a NoE is to facilitate the interaction between its partners to further its stated goals. This WP aimed to contribute to this by encouraging and monitoring the exchange of short visits between partners.

In the NoE proposal, the role of this WP is described as constantly monitoring the mobility of researchers inside the Network, publishing the available positions, finding such positions in industry, allocating researchers to relevant positions and evaluating the exchange procedure.

### 3.5.2. Implementation Evaluation

The summary of the short visits given in the table below clearly indicates that there was a lot of NoE-supported activity under this WP. In total, 40 short visits and 10 SCHEMA meetings had taken place involving all Full Members, either as visitors or as hosting teams, at least once. It should be noted that a PhD student from the UPC also spent 7-month at BTEExact. This exchange does not fit into the definition of a SCHEMA short visit, neither by the extent of the stay nor by the supporting source (no funding from SCHEMA was involved). However, it shows that the NoE gave the start to longer-term, bilateral collaborations.

To assist with the organization of short visits between researchers and to disseminate reports on these visits, a web site was implemented including e-forms and dynamically updated lists for exchange reports: <http://www.cs.tut.fi/~guldogan/Schema/op.html>. Although quite convenient, this interface was not robust enough to user mistakes, resulting sometimes in blank entries in the list of short visits.

In terms of each of the elements of this WP activity given in the SCHEMA proposal, the implementation proceeded as originally planned. Clearly, short visits tended to occur organically

as a result of an emerging shared research interest between two (or more) partners, with an increase of the frequency of the visits toward the end of the project.

Deliverables produced			
Title	Scheduled	Delivered	Partners involved
D5.1: Exchange of Short Visits - First Report	09/30/2003	09/30/2003	1
D5.2: Exchange of Short Visits - Final Report	03/30/2005	03/01/2005	1

SCHEMA short visits	
Number of short visits	40 <sup>1</sup>
Number of partners involved	12
Number of visiting people	57
Number of countries visited	13
Cumulative time	143 days <sup>1</sup>

<sup>1</sup>These figures do not include a 7-month stay at BTEexact of a PhD student from the UPC. No funding from SCHEMA was involved.

### 3.5.3. Impact Evaluation

Alongside the Technical Committee meetings, it is clear that the short visits and the remote collaboration that proceeded and followed them made a core contribution to the goals of the NoE. Generally, short visits arose out of bilateral contacts by partners with mutual interests. Visits were arranged based on individual researchers' personal timetables (factoring in multiple constraints). As such, instigating a formal process for advertising and subsequently filling positions was neither appropriate to this kind of activity, nor likely to have been workable in practice. Unfortunately, the approach used also served to hide somewhat the researcher mobility dimension to the Network. However there were three ways to follow the short visit activities: regular browsing of the short visit webpage, the reading of the deliverables produced under this WP, and the reading of the Progress Reports produced for each period.

## 3.6. WP6: Dissemination and exploitation

### 3.6.1. Overview

The aim of this WP was to implement and monitor another of the crucial roles of a NoE, which is to promote dissemination and exploitations activities.

### 3.6.2. Implementation Evaluation

This WP produced three deliverables (listed in the table below), two of which were released with some delay. These two documents explored the role the technology developed by SCHEMA could play in the industry.

Deliverables produced			
Title	Scheduled	Delivered	Partners involved
D6.1: Information Dissemination	03/30/2005	03/01/2005	13
D6.2: Market Study	09/30/2004	01/04/2005	13
D6.3: Common Exploitation Plan	09/30/2004	01/04/2005	13

Aspects of the implementation can be described under the following eight headings.

#### *Dissemination Activities*

- (i) The development and maintenance of the SCHEMA web server and newsletter

This service has been operational since the start of the project (See <http://www.iti.gr/SCHEMA/>). The website hosts the SCHEMA library. The content of the library at the time of preparation of this document is outlined in the table below.

SCHEMA Library Contents	
Journal Publication	17
Conference Publication	130
Book Chapter	1
Report	10
Deliverable	14
Meeting Agenda/Report presented at a meeting	36

- (ii) Organisation of common publications and presentations

The table below lists the conference publications supported by SCHEMA, and it is clear that there is a high level of publication activity by the partners in the NoE, with a significant level of papers involving more than one NoE partner.

Conference	Publications	Partners involved
ACIVS 2003	1	1
APS Conference	1	1
ARCS Workshop 2004	1	1
CBMI 2003	4	7

Conference	Publications	Partners involved
CBMI 2005	1	2
CIVR 2004	1	2
COST 276 Workshop on Information and Knowledge Management for Integrated Media Communication 2003	1	1
COST 276 Workshop on Transmitting Processing and Watermarking 2003	1	1
DSP 2002	4	2
ECCV 2002	1	1
EURASIP NSIP 2003	2	1
EUSIPCO 2004	3	3
EVA Conference 2004	1	1
EWIMT 2004	2	3
FINSIG 2003	1	1
ICASSP 2003	1	1
ICASSP 2004	2	1
ICASSP 2005	3	2
ICCS 2005	1	1
ICIP 2002	6	4
ICIP 2003	13	8
ICIP 2004	3	3
ICIV 2004	5	5
ICME 2002	1	1
ICME 2003	2	1
ISSC 2003	1	1
ISSPA 2003	2	1
ISSPIT 2003	1	1
ISSPIT 2004	1	1
IWDC 2002	6	3
MELECON 2004	1	1
MIR 2003	2	1
MMSP 2002	1	1
Mobile HCI 2003	1	1

Conference	Publications	Partners involved
MUM 2003	1	1
PCS 2003	1	1
PV 2003	1	1
RIAO 2004	1	1
SPIE 2002	1	1
SPIE 2003	1	1
SPIE 2005	2	3
TRECVID 2003	1	1
TRECVID 2004	1	1
VCIP 2003	3	2
VCIP 2004	1	1
VIE 2003	1	1
VIE 2005	1	1
WIAMIS 2001	2	2
WIAMIS 2003	19	17
WIAMIS 2004	7	5
WIAMIS 2005	6	8
Workshop on Novel Techniques for Digital Preservation, Information Processing and Access to Cultural Heritage Collections 2004	1	1
WSSIP 2002	1	1

(iii) Organisation of common participation in exhibitions, etc.

The table below indicates a range of meetings, demonstrations and dissemination activities that took place at different venues/exhibitions during the lifetime of the project to date, at which SCHEMA was promoted with a presentation or exhibition stand as appropriate.

Nature of Event	
Presentation of SCHEMA (including to the Press)	13
Demos for industrial actors/institutions	20
Other forms of dissemination (e.g., brochures distribution)	13
Follow-ups	20

In addition to contributing to existing dissemination activities, the project has been proactive in organising new dissemination activities. In this context, the following activities have taken place:

- SCHEMA and two related projects (BUSMAN and FAETHON) were demonstrated through an exhibitor's booth during IEEE International Conference on Image Processing 2003, September 14-17, 2003, Barcelona, Spain.
- During the Third International Workshop on Content-Based Multimedia Indexing, September 22 - 24, 2003, IRISA, Rennes, France (CBMI 2003), SCHEMA organised a special session entitled "Content-Based Semantic Scene Analysis" including five relevant papers.
- As a clustering activity, Alinari has also provided a set of images to the FAETHON project in September 2003. The images have been already indexed and tested.
- SCHEMA co-organised special sessions during the following events:
  - The 8th International Conference on Information Visualisation (IV 2004), July 14-16, 2004, London, England.
  - The 3rd International Conference on Image and Video Retrieval (CIVR2004), July 21-23, 2004, Dublin City University, Ireland.
  - The 12th European Signal Processing Conference (EUSIPCO 2004), September 6-10, 2004, Special session: "Content Understanding and Knowledge Modelling for Multimedia" co-organised with NoE DELOS, Vienna, Austria.
- SCHEMA supported the organization of the 4th, 5th, and 6th International Workshop on Image Analysis for Multimedia Interactive Services (WIAMIS 2003, 2004, and 2005). During WIAMIS 2004, a special session in newly established 6th FP IST Projects has been organized as a clustering event. The following seven relevant 6th FP IST projects participated AceMedia, Metokis, MediaNet, VISNET, PrestoSpace, DirectInfo and CHIL. During WIAMIS 2005, the NoE support included 4 special sessions chaired by SCHEMA partners.

(iv) Organization/co-organization/support of three international workshops

The first of these was the very successful WIAMIS 2003 workshop held in Queen Mary University of London, London, April 2003. A Special Session in IST-Projects was organized as a clustering event during WIAMIS 2003. Fourteen relevant IST projects were invited and made technical presentations.

WIAMIS 2004 was organized by the Instituto Superior Técnico, Lisbon, Portugal, April 21-23, 2004. SCHEMA organized a special session entitled "Semantic-based Multimedia Analysis and Access". It was attended by seven IST Projects.

WIAMIS 2005 was organized by the École Polytechnique Fédérale de Lausanne (EPFL) in Montreux, Switzerland, April 13-15, 2005. It was sponsored by SCHEMA and the NoE organized 4 special sessions.

*Exploitation Activities*

(v) Relevant market studies and common exploitation strategies

This activity officially started in Year 3 of the NoE. However, it had received significant attention from external parties during earlier dissemination activities. Furthermore, it was

felt that this activity may require more time than currently allocated in the Technical Annex. As such, it was recommended in Deliverable 7.1 that this activity start as soon as possible, i.e. even before the date scheduled in the Technical Annex, in order to be able to make strong statements on this issue when required. Qualitatively speaking, the very positive response of industry actors and institutions (See table “Nature of Event” presented in point (iii) above) to SCHEMA research activities and developed technology reinforces the realistic dimension of the NoE market study and proposed common exploitation strategy. These studies were based on the observation that, to the NoE’s knowledge, no existing solutions offer the efficiency required by the market needs in terms of advanced visual search tools. In this context, a product based on the SCHEMA Reference System would have a non-negligible chance of success. The last evolution of the Reference System, SchemaXM, can already be considered as a demonstrator for a content-based indexing and retrieval application. The SchemaTREC version combines the visual descriptor approach of SchemaXM with Schema-Text, a text-based query module. It clearly represents an advanced proof of concept for handling text-annotated media. The applications identified as potential market evolutions of the SCHEMA Reference System encompass virtually any product that should provide fast and relevant access to a large collection of visual data. It includes medical atlases, education, cultural heritage, entertainment, etc. However, some financial considerations might refrain an industrial from developing an entirely new product from the Reference System. Instead, the proposed common exploitation plan suggests that the SCHEMA technology could be injected into an existing product or service.

As far as SCHEMA partners are concerned, Alinari has developed a new version of the Reference System called SCHEMA-Alinari. It is based on a 20000-image database fully annotated, either reflecting the content or the origin of the images. This development is done in parallel with the design of a new web interface: <http://schema.alinari.it/> with a plan for a future business activity. Based on this, a PDA application using the SCHEMA reference system has also been developed on the Windows Mobile-based PocketPC platform.

(vi) Development of future partnerships; R&D projects, 6th Framework Programme

The table below outlines all new FP6 research project proposals that SCHEMA members have been involved in. Clearly, SCHEMA members are extremely active in pursuing new funding opportunities.

Acronym	Full Project Name	Instrument <sup>†</sup>	Strategic Objective/Area	Call <sup>§</sup>	Successful
aceMedia	Integrating knowledge semantics and content for user-centred intelligent media services	IP	Semantic-based knowledge Systems	1	<b>Yes</b>
CHIL	Computers in the Human Interaction Loop	IP	Multimodal Interfaces	1	<b>Yes</b>
CUBE	CUBE	IP	Cultural heritage harmonization	1	No
SENSE-TO-	Semantic and Knowledge Based	MC – RTN	Human resources and mobility	1	No

Acronym	Full Project Name	Instrument <sup>†</sup>	Strategic Objective/Area	Call <sup>§</sup>	Successful
KNOW	Analysis of Multimedia Content				
3DTV	Integrated Three Dimensional Television – Capture, Transmission and Display	NoE	Promotion of European leadership in applied technologies at the heart of knowledge economy	2	<b>Yes</b>
BEING THERE	Scalable telepresence	NoE	Networked Audiovisual Systems and Home Platforms	1	No
CACHE	CACHE	NoE	Preservation digitalization	1	No
COSMIC	Quality of Experience driven CrOsS-Media Integrative reseach	NoE	Cross-media content for leisure and entertainment	2	No
DELOS	NoE on Digital Libraries	NoE	VUT: Storage and retrieval of non-traditional objects (image, video, audio, etc.)	1	<b>Yes</b>
IRiX	Information Retrieval in Context	NoE	Semantic-based knowledge systems	1	No
Knowledge Web	Realizing the Semantic Web	NoE		1	<b>Yes</b>
medimpro	medical image processing interpretation and archiving	NoE	ist-2002-2.3.1.11	1	No
MUSCLE	Multimedia Understanding through Semantics Computation and Learning	NoE	Semantic-based knowledge systems	1	<b>Yes</b>
nemsip	Signal and image processing methods and tools for multimedia communication	NoE		1	No
SCENES	Sensory Communications and Exploration in Natural Environments	NoE	Multimodal Interfaces	1	No
SIMILAR	SIMILAR	NoE	To develop natural and adaptive multimodal interfaces that respond intelligently to speech and language vision	1	<b>Yes</b>

Acronym	Full Project Name	Instrument <sup>†</sup>	Strategic Objective/Area	Call <sup>§</sup>	Successful
			gesture haptics and other senses		
SIMILAR	Human-machine interfaces SIMILAR to human-human communication	NoE	Multimodal Interfaces	1	Yes
VISNET	Networked audiovisual media technologies	NoE	Networked Audiovisual Systems and Home Platforms	1	Yes
Xmedia	Semantic Processing of Multimedia Documents	NoE	Semantic-based knowledge systems	1	No
DIRECT-INFO	Media monitoring and multimodal analysis for time critical decisions	STREP	Semantic-based knowledge systems		Yes
REVEAL THIS	Retrieval of Video and Language for The Home user in an Information Society	STREP	Cross-media content for leisure and entertainment	2	Yes

Notes: <sup>†</sup> IP: Integrated Project, MC-RTN: Marie Curie Research Training Network, NoE: Network of Excellence, STREP: Specific Targeted Research Project.

<sup>§</sup> Call 1 identifier: FP6-2003-IST-2, Call 2 identifier: FP6-2003-IST-2.

(vii) Preparation of a working commercial solution that could be of use, after the end of the project for the mass market

Before offering a commercial solution, one must check that the product installs and runs properly on different hardware configurations. A simple installation procedure must also be provided. Until now, the SCHEMA Reference System has been run and maintained on a single machine environment. As the development of the Reference System tends toward a user-level product (as opposed to a research tool), the partners decided to launch an installation campaign on different partners' machines. This activity should be completed by the end of the project and provide an installation procedure of the SCHEMA Reference System.

(viii) The continuous expansion of the SCHEMA network where appropriate to the achievement of the Network objectives.

Considering the large number of Affiliated Members in the project, as reported upon in Section 2, it is clear that this activity has taken place successfully. In addition, the projects that have been officially contacted by SCHEMA so far are outlined in the table below.

SCHEMA EU Project Clustering	
FP5 Projects	FP6 Projects
Esperanto	aceMedia
MUMIS	Metokis
NEMIS NoE	KnowledgeWeb
MOSES	Medianet
FoundIt	EPerSpace
VICODI	VISNET
SWAP	Muscle
FAETHON	Delos
CUIDADO	Presto Space
COLLATE	Direct Info
CIMWOS	CHIL
Por.Com	
VIBES	

### 3.6.3. Impact Evaluation

This WP was involved in a broad range of objectives in order to achieve the promotion, dissemination and exploitation goals of the NoE. Each of the individual areas of dissemination and exploitation has demonstrated strong and sustained activity. All of the relevant outputs have been collected in the SCHEMA library and details are available on the SCHEMA website. Excluding the delayed release of Deliverables D6.2 and D6.3, this WP meet the objectives of the NoE in this area. The number and quality of the contacts with researchers, industrials and institutions, and the very positive response to them, is a sign of the efforts made in this WP.

### 3.7. Unforeseen activities

This section documents activities that took place within the Network, but that were not foreseen in the original project plan.

#### 3.7.1. The Qimera Initiative

The Qimera initiative started off as a collaborative voluntary research project. Its objective was to develop a flexible, modular software architecture for video object segmentation and tracking which could be used as a vehicle and test-bed for collaborative algorithm development. The partners involved in this initiative were all members of SCHEMA. As such, a natural progression for this activity was for it to be brought under the umbrella of SCHEMA, with the Network funding short scientific missions and conference travel. When mature, the algorithms developed within Qimera have been integrated into the SCHEMA Reference System, being developed by WP3, and is no longer a standalone application.

### 3.7.2. Participation in TRECVID 2004

TRECVID (i.e. the Video Track of the NIST Text Retrieval Conference) is an annual world-wide activity for benchmarking content-based retrieval systems. Activities such as test corpus distribution, specification of features, queries and associated ground truth and collection of results are coordinated by NIST in the USA and the process culminates in a workshop. SCHEMA applied for participation in TRECVID 2004 in the search task. The extension of the Reference System to deal with video by defining motion descriptors was encouraged by the participation to this challenge. The necessary benchmarking process also leveraged the overall development of the SCHEMA Reference System. A text-based query functionality was added to be used by itself (Schema-Text) or in conjunction with the image and video modules. SCHEMA registered as a single entity and performed very honourably. As a consequence, the project had the opportunity to give an oral presentation and a demo during the workshop, which is quite rare for a first-time participant.

A recent outcome of the participation of SCHEMA to TRECVID 2004 is its invitation by the National Institute of Standards and Technology (NIST) to give a presentation at the Joint MPEG/JPSearch sessions held during the MPEG Meeting in Hong Kong.

### 3.7.3. Impact Evaluation

The importance of these activities within the NoE was substantial. Indeed SCHEMA is to be congratulated for having supported and stimulated these activities. These activities are a clear indicator of the success of the NoE whereby high quality research has been carried out despite the fact that it was not planned, nor budgeted for.

## 4. Conclusions

This document, corresponding to project Deliverable D7.2: Final Evaluation Report, describes the results of a self-evaluation of the SCHEMA Network of Excellence. The evaluation was carried out by WP7 of the project. In Section 2, the size, scope and membership of the Network were considered. In the remainder of the document, i.e. Section 3, the specific activities that have taken place per project work package were considered. In each case, these activities were evaluated considering two criteria: Whether activities were in fact taking place according to the project plan and the effectiveness of these activities in practice.

There have been no major deviations from the project plan. Similarly, there have been no management issues or conflicts that have arisen and the project has run smoothly since its inception. Furthermore, extra activities and collaborations took place that were not foreseen at the outset of the project. In light of this evaluation, there is no doubt that the Network met its outstanding objectives.

## APPENDIX A: SCHEMA Membership

Detailed profiles of all SCHEMA members are available on the official SCHEMA web site (<http://www.iti.gr/SCHEMA/partners/index.html>)

SCHEMA Network membership by country		
Full Members		
Belgium	Université Catholique de Louvain	UCL
Finland	Tampere University of Technology	TUT
France	Laboratoire d'Informatique, Signaux et Systèmes de Sophia Antipolis	I3S
Germany	Munich University of Technology, Institute for Integrated Circuits	TUM
Greece	Centre for Research and Technology – Hellas, Informatics and Telematics Institute	ITI
	Macedonian Press Agency	MPA
Ireland	Dublin City University, Centre for Digital Video Processing	DCU
Italy	Fratelli Alinari, Museum & Photographic Archive	ALINARI
	Fondazione Ugo Bordonni	FUB
	University of Brescia, Signal and Communication Laboratory	UNIBS
Spain	Universitat Politècnica de Catalunya, Image Processing Group	UPC
UK	BTextact Technologies	BT
	Queen Mary University of London, Multimedia and Vision Group	QMUL

SCHEMA Network membership by country		
Affiliated Members		
Australia	Monash University, Gippsland School of Computing and Information Technology	
	University of Queensland, Data and Knowledge Engineering Group	
Austria	JOANNEUM RESEARCH Forschungsgesellschaft mbH, Institute of Information Systems & Information Management	
	Vienna University of Technology, Interactive Media Systems Group	
Bulgaria	Institute of Information Technologies, IIT-BAS	
China	Shangai University, Digital Image & Video Processing Lab	
Denmark	Percepton	
France	Centre for Research and Restoration of the Museums of France (C2RMF)	
	I-Source Gestion SA	
	LTU Technologies	
	Pertimm	
Germany	Thomson multimedia R&D France	
	Content Mine International	
	University of Saarland, Computational Linguistics Department	
Greece	ZGDV e. V. Rostock	
	Aristotle University of Thessaloniki, Department of Informatics, Computer Vision and Image Processing Group	
	ATC	

SCHEMA Network membership by country	
Affiliated Members	
	Cultural and Educational Technology Institute
	Institute for Language and Speech Processing (ILSP)
	Melon Web, Knowledge Solutions
	Microsoft Hellas
	National Technical University of Athens, Department of Electrical & Computer Engineering, Multimedia Group
	University of Patras, Electronics Laboratory
	University of Patras, Multimedia Coding and Watermarking Group (MCWG)
Italy	3LOGIC
	DIVICAS
	Italian National Agency for New Technologies, Energy and the Environment (ENEA), UDA-Advisor Unit
	Università di Firenze, Dipartimento Sistemi e Informatica (DSI-UNIFI)
Korea	University of Trieste, Image Processing Lab
	Kangwon National University, Multimedia Security Lab
Netherlands	Telematica Institute
	University of Twente, Department of Computer Science
Portugal	INESC PORTO - Telecommunications and Multimedia Unit
Spain	iSOCO
	Telefonica
	Visual Century Research
Turkey	Middle East Technical University (METU), Computer Vision and Intelligent Systems Research Laboratory
	Middle East Technical University (METU), Department of Electrical & Electronic Engineering, Multimedia Research Group
UK	Motorola UK Research Lab (MUKRL)
	Nielsen Media Research
	Search Software
	University of Oxford, Image Bioinformatics Research Lab
USA	eVision, Visual Search Technology
	Hewlett-Packard Laboratories (HPL)

SCHEMA Network membership by profile		
Full Members		
Industrial (non-SME)	BTexact Technologies	BT
	Macedonian Press Agency	MPA
Research Institute	Fondazione Ugo Bordoni	FUB
	Laboratoire d'Informatique, Signaux et Systèmes de Sophia Antipolis	I3S
	Centre for Research and Technology – Hellas, Informatics and Telematics Institute	ITI
Small to Medium Size Enterprise	Fratelli Alinari, Museum & Photographic Archive	ALINARI
University	Dublin City University, Centre for Digital Video Processing	DCU
	Queen Mary University of London, Multimedia and Vision Group	QMUL
	Munich University of Technology, Institute for Integrated Circuits	TUM
	Tampere University of Technology	TUT
	Université Catholique de Louvain	UCL
	University of Brescia, Signal and Communication Laboratory	UNIBS
	Universitat Politècnica de Catalunya, Image Processing Group	UPC

SCHEMA Network membership by profile		
Affiliated Members		
Industrial (non-SME)	Hewlett-Packard Laboratories (HPL)	
	Microsoft Hellas	
	Motorola UK Research Lab (MUKRL)	
	Telefonica	
	Thomson multimedia R&D France	
Other	Centre for Research and Restoration of the Museums of France (C2RMF)	
	Italian National Agency for New Technologies, Energy and the Environment (ENEA), UDA-Advisor Unit	
Research institute	Cultural and Educational Technology Institute	
	Institute for Language and Speech Processing (ILSP)	
	Institute of Information Technologies, IIT-BAS	
	JOANNEUM RESEARCH Forschungsgesellschaft mbH, Institute of Information Systems & Information Management	
	Telematica Institute	
Small to Medium Size Enterprise	3LOGIC	
	ATC	
	Content Mine International	
	DIVICAS	
	eVision, Visual Search Technology	

SCHEMA Network membership by profile	
Affiliated Members	
	INESC PORTO - Telecommunications and Multimedia Unit
	iSOCO
	I-Source Gestion SA
	LTU Technologies
	Melon Web, Knowledge Solutions
	Nielsen Media Research
	Percepton
	Pertimm
	Search Software
	Visual Century Research
	ZGDV e. V. Rostock
	University
Kangwon National University, Multimedia Security Lab	
Middle East Technical University (METU), Computer Vision and Intelligent Systems Research Laboratory	
Middle East Technical University (METU), Department of Electrical & Electronic Engineering, Multimedia Research Group	
Monash University, Gippsland School of Computing and Information Technology	
National Technical University of Athens, Department of Electrical & Computer Engineering, Multimedia Group	
Shangai University, Digital Image & Video Processing Lab	
Università di Firenze, Dipartimento Sistemi e Informatica (DSI-UNIFI)	
University of Oxford, Image Bioinformatics Research Lab	
University of Patras, Electronics Laboratory	
University of Patras, Multimedia Coding and Watermarking Group (MCWG)	
University of Queensland, Data and Knowledge Engineering Group	
University of Saarland, Computational Linguistics Department	
University of Trieste, Image Processing Lab	
University of Twente, Department of Computer Science	
Vienna University of Technology, Interactive Media Systems Group	

**APPENDIX B: SCHEMA Short Visits**

Visiting Institution	Host Institution	Number of Days	Year
UPC	BT	7 months	2002-2003
DCU	University of Padova	14	2003
I3S	UCL	14	
I3S	UNIBS	1	
ITI / DCU / UNIBS	TUM	3	
QMUL / TUM	Qimera Lab. (DCU)	4	
UCL	BT	1	
UCL	I3S	2	
UCL	I3S	2	
UCL	TUT	2	
UNIBS	BT	2	
UNIBS	I3S	3	
UPC	DCU	6	
UPC	Imperial College of London	2	
UPC	Qimera Lab. (DCU)	5	
UPC	UCL	2	
I3S	ITI	5	2004
I3S	UCL	3	
I3S	UCL	3	
ITI	University of Karlsruhe	2	
QMUL	University Belgrade / University Novi Sad	9	

Visiting Institution	Host Institution	Number of Days	Year
TUM	UPC	1	
TUM	UPV	1	
TUM	University of Karlsruhe	1	
UCL	I3S	3	
UNIBS	I3S	2	
UPC	I3S	3	
UPC	QMUL	2	
UPV	TUM	3	
I3S	UPC	5	
ITI	University of Stockholm	1	Total 42 days in 12 visits
QMUL	Universidad Autonoma de Madrid / Telefonica Investigacion y desarrollo	9	
QMUL	University of Technology and Economics of Budapest	5	
QMUL / HHI	Technische Universitat Berlin	10	
TUM	Edacentrum	2	
TUM	IBM Böblingen	2	
TUM	IBM Zurich Lab	1	
TUM	University of Karlsruhe	2	
UCL	I3S	2	
UPC	ENST Paris	2	
UPC	UCL	1	