Kaleidoscope Impact and lessons learned. A position paper

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Kaleidoscope
Impact and lessons learned

A position paper

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This document is based on the contributions of the 2007 Kaleidoscope Executive Committee and the Kaleidoscope Joint Activities leaders (see the Annex 2 for the list of names).

1. Reminder about the project and its ambition

<u>Associated document</u>: *Concepts and methods for exploring the future of learning with digital technologies. Kaleidoscope proposal for an NoE* (2003, Collective document[3]).

The aim of Kaleidoscope was to foster integration of different research disciplines relevant to technology enhanced learning (TEL), bridging educational, cognitive and social sciences, and emerging technologies. This ambition was both scientific and strategic:

- It was scientific by its aim "to develop a rich, culturally-diverse and coherent theoretical and practical research foundation for research and innovation in the field", exploring "the different conceptual frameworks of relevant disciplines in order to delineate the commonalities and differences that frame the research objectives in the field"
- it was strategic by its aim "to develop new tools and methodologies that operationalise an interdisciplinary approach to research on TEL at a European-wide level" with the expectation of a significant impact at the international level.

To bring this ambition to reality, in a very fragmented European TEL research area, it chosen to involve a large number of contributors of which only a small number were already collaborating, and a large range of different research themes. A set of instruments was planned to support the construction of the network and the integration process at both the content and the infrastructure level.

The decision to fund Kaleidoscope, and to rank it first, was taken because of its "generic approach and wider scope and its strong long-term research and structuring potential."

It is with these ambitions and expectations in mind that this document analyses the activity of Kaleidoscope and suggest lessons which can be learned from what we consider as being the first period of the life of the network. In the first section we analyse the levels of integration from a community and a scientific perspective. Then, we examine the supporting infrastructure. A third section focuses on dissemination of excellence and the impact. We then

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[3] http://telearn.noe-kaleidoscope.org/warehouse/KalPartBfinal_(001771v1).pdf

consider the NoE instrument as such, and question the synergy between the review process and the project development. The conclusion summarizes the lessons learned.

2. Levels of integration

Kaleidoscope is the product of a synergy between three expressions of interest for the FP7 new instrument "Network of Excellence" as a response to the call launched by the Commission in 2002. This instrument was seen as a potentially efficient tool to structure and strengthen research communities in different areas: Educational Technology (EoI of the LKL, London, UK), Computer Supported Collaborative Learning (EoI of Intermedia, Bergen, NO) and Technology for Human Learning (EoI of the CNRS, Grenoble, FR). The challenge was that of overcoming all the fragmentation lines which TEL research had to deal with (different disciplines, research traditions and organisations, etc.) A large number of the members of Kaleidoscope had no previous collaboration, except in limited clusters, and often were only partially familiar with the diversity of the frameworks in which TEL research is carried out. The challenge of integration was real, but the willingness to succeed and the expectations about the return of this investment were high. The following sections analyse the effectiveness and success of the integration, and reflect the difficulties encountered. An other section will later analyse the evolution under the light of the interactions between the project and its reviews (section 4).

2.1. The different levels of integration

The level of integration targeted by Kaleidoscope is the level of the research units. It is at this level that long terms research agenda and a scientific policy can be constructed, with a commitment on resources and means to be shared. This would have been difficult to achieve in a large network such as Kaleidoscope without an operational structuration based on clusters with focused objectives. It is what was intended by the creation of the *European Research Teams* (ERT). However, only few such integrated teams could be established from the beginning, then a tool was needed to provide researchers as individuals with a framework to integrate their interest and scientific activity. For this purpose the *Special Interest Groups* (SIG) were created. Then, the initial plan, confirmed at the time of the hearing of the network, was to give a priority at increasing the number of ERTs, while strengthening the SIGs with possible extension depending on the perceived evolution of the field. The table below shows how this has been implemented, a more detailed analysis is then given for each type of instrument.

	2004	2005	2006	2007
ERTs	2	4	6	6
SIGs	9	8	6	7

2.1.1. The European Research Teams (ERT)

The objective of an ERT is on the one hand to stimulate the mutualisation of knowledge and know-how of a cluster of research units on a specific theme, and on the other hand to favour the construction of a shared scientific policy, built on complementarities and common priorities. The ERTs were created following a standard process of open internal call and evaluation for selection.

	2004	**2005**	**2006**	**2007**
Format production of educational format	X	X	X	X
TELMA technology enhanced learning in mathematics	X	X	X	X
ProdLearn condition for productive networked learning environements		X	X	X
CoSSICLE computer-supported scripting of interaction in collaborative learning environments		X	X	X
CAViCoLA computer-based analysis and visualisation of collaborative learning activities			X	X
CIEL integrating collaborative, inquiry and experiential learning			X	X

To support their effort, the ERTs received each year a lump sum (between 67 and 100 KEuros). The following provides a synthetic view of tangible outcomes of their integration:

Doctoral integration:
    Co-supervised PhD: TELMA 2, CoSSICLE 2, CIEL 1, CAViCoLA 1, Format 3, ProdLearn 4
    Joint PhD evaluation: CIEL 2, CAViCoLA 3, ProdLearn 16
    PhD training: TELMA mobility (2 and a consulting service for PhD students), ProdLearn (workshop), CoSSICLE (workshop), Format (4 workshops), CAViCoLA (ERASMUS exchanges)
    VDS PhD activities: Format and CoSCICLE in collaboration, TELMA, ProdLearn
Co-authored papers: TELMA 6, ProdLearn 35, CoSSICLE 22 (increase of 30% second half of the period), CAViCoLA 4, CIEL 2, Format 8
Edited books: TELMA (special issue of IJCML), ProdLearn (Sense Pub 2008), CoSSICLE (Springer 2007)
Joint projects: TELMA STREP ReMath, CIEL IP SCY (in collaboration with the SIG CSIL), CAViCoLA STREP ARGUNAUT and a German grant

Attention must be drawn to the fact that these data cannot be compared in a straightforward way. All these ERTs were not born in the same condition, not to mention that some are younger than others. These data evidence the reality of integration. Producing a paper or a book collaboratively is a long process which demonstrate the integration of scientific ideas and frameworks. The impact of the integration is significant when it reaches PhD students who have been involved in all cases with a range of activities from PhD workshops to PhD co-supervision. This level of collaboration suggests that a long lasting integration will be possible for several of the ERTs as expected. This is supported by verifiable sustainability indicators in all cases:

ERT	MoU	Successful bid	Plan / on-going
Format Production of Educational formats	In process (already 4 from 6 institutions signed)		Submission to next IST-TEL call *A Minerva project has been submitted, unsuccessful but positively evaluated)*
TELMA Technology Enhanced Learning in Mathematics	In process (already signed within REMATH and Kaleidoscope Association)	RE-MATH, STREP (FP6 IST call 4) involving all TELMA teams	
ProdLearn Condition for productive networked learning environment	In process	Some partners are involved in STREPs	On-going preparation of a submission to FP7 + Successful acquisition of complementary funding from national bodies
CoSSICLE Computer supported scripting of interaction in collaborative learning environments		Erasmus (bi-lateral) between LMU and JYU	Several successful acquisition of complementary funding from national bodies On-going preparation of joint applications to FP7
CIEL Integrating Collaborative, Inquiry and Experiential Learning		SCY (Science Created By You) FP7 IP, direct successor of CIEL	
CAViCoLA Computer-based Analysis and Visualization of Collaborative Learning Activities		Erasmus exchange between the 3 computer science partners (Valladolid, Patras, Duisburg) Some partners are involved in a STREP (Argunaut) reusing the ERT work and collaborating with teams	Successful acquisition of complementary funding from national bodies Plan to prepare a joint application to FP7 (call 3) + German research grant

2.1.2. The Special Interest Groups (SIG)

The SIGs are based on individual commitments. In SIGs take place exchanges which can give rise to new topics and questions, the communication is at an individual level and develops in an open and non constrained way. Workshops, conferences and any type of collaborative working tool have supported these activities. The key outcome of SIGs is to support the dynamic of the development of the network benefiting from individual expertise and creativity. SIGs are also a strong vector of dissemination at the international level where individual researchers usually communicate and collaborate in informal but efficient forms with the rest of the community.

	2004	2005	2006	2007
Context context and learning	X			
LT@W learning and technology at work	X	X		
Participatory Design	X	X		
AIED artificial intelligence and education	X	X	X	X
CSCL computer-supported collaborative learning	X	X	X	X
CSIL* computer-supported inquiry learning	X	X	X	X
GRID learning grid	X	X	X	X
NLE narrative and learning environment	X	X	X	X
PTEL philosophy of TEL	X	X	X	X
MLearn mobile Learning				X

* Initially named CSILS, the name of the SIG lost the S (for Science) to open itself to
a larger range of content.

Integrating individual researchers provide the best ground for a structuration of the research area with the objective of a collective building of a scientific policy, although it is at the level of the research units and institutions that the necessary means and long lasting frameworks can be ensured. This worked well in several cases.

The SIG CSCL has stimulated the creation of the ERTs CoSSICLE, ProdLearn and CAViCoLA, the later in collaboration with the SIG AIED. The SIG CSIL has led to the creation of the ERT CIEL with a strong interaction with the SIG CSCL. The creation of ERTs from the SIGs PTEL and NLE has been discussed, but it the conclusion was that it would have been counter productive for these emergent communities working on a new topic: the creation of an ERT needs the existence of a sufficiently large and robust scientific environment, what is expected in the future for these two SIGs as witnessed by their more recent outcomes. The case of the SIG Mobile learning demonstrates the Kaleidoscope dynamic and policy. On this new topic, mobile learning, a JEIRP was first allowed to explore the domain and provide a first framework for an integrated policy, then an Initiative provided a preview of a possible SIG which, once created, has a strong impact in Europe and internationally.

Two SIGs were created but were not maintained, very likely because none of them reached the threshold of participation. In the case of the SIG LT@W, the problem came from the too divergent content foci of the participants: from mathematics on the work place to surgery. The theme is relevant, but needs a different strategy to be addressed properly. It was then decided to address it in different ways, taking into account the emergence of specific needs for adaptive learning environment in different sectors (e.g. surgery, banks). The case of the SIG productive learning is more related to the difficulty to differentiate enough between its focus and similar issues addressed in other SIGs (especially CSCL and AIED).

The closing of the SIG Context has a completely different rationale. It is due to a rejection of the administrative constraints of the contract by the leaders, what was explained by a letter at

that time; however the publication of a book after the SIG had been closed demonstrates the quality and positive scientific synergy within the community. One may suggest that this case exemplifies in a radical way a point made by successful SIGs: "in the first years some problems aroused considering the activities with immediate cost and a benefit that is not so clear in the short run", and it is problematic to run "an activity bound by a 'Technical Annex' while the activity of individual and the dynamic of integration need much more flexible context". Another difficulty for SIGs is to ensure a return of the investment in a short term. For example, a remark coming from SIG PTEL is that "what has been achieved clashed with the novelty and emerging nature of the theme". However this SIG, after experimenting this difficulty, was able to organise an international seminar in this new domain.

The SIGs worked well as incubators of significant actions as mentioned above, but also to fight the fragmentation of the TEL research area. The interactions between the three SIGs CSCL, CSIL and MLearn were bootstrapped by the Convergence workshop (Amsterdam 2006) and the Alpine Rendez-vous (Villards 2007). The later, with an important international participation, was a first edition of an original type of meeting which will be held yearly (next to be held in January 2008). The AIED SIG, which strengthened significantly the European research in its specific area, is developing collaborations with the SIG GRID (joint symposium at AIED 2007) and with the SIG NLE for a joint project. Most SIGs reached concrete outputs in the second part of the period we analyse, as witnessed by collaborative editorship which includes books and journal special issues for the following SIGs: GRID (Sense pub. 2008), NLE (Sense pub. 2006, IJCEELL 2005 special issue), CSIL (JCAL 2007 special issue). Two SIGs have also used the TeLearn archive to disseminate the work of the community, with 130 pdf files uploaded for the CSCL SIG and 100 files for the GRID SIG. The dates we observe are indicators of the time needed to understand what a network as Kaleidoscope is and to find the best interface to foster the collaboration between the different SIGs as well as the collaboration between researchers within a given SIG.

Moreover the SIGs have played an important role in the Kaleidoscope PhD training policy, by their contribution to the Virtual Doctoral School (NLE, CSCL, LT@W, MLearn, PTEL and one in collaboration CSCL-CSIL), and several specific actions (CSCL2005, AIED seminars, Narrative online conference).

From the point of view of sustainability, the SIGs are adopting different models: scientific community based on a website which will be maintained for the SIG NLE, SIG CSCL within the International Association for the Learning Science (ISLS), SIG CSIL within the European Association for Research on Learning and Instruction (EARLI), MLearn chapter of the International Association for Mobile Learning (IAML), GRID vertical working group of NESSIE. The SIG AIED has worked de facto as a chapter of the international AIED organisation. This policy does not contradict the membership to Kaleidoscope, and in the future to the structure we are building, because it provides an excellent framework to fight the tendency to fragmentation and provides a structured context for the emergence of actions across the specific research areas.

2.2. The need for flexible tools

Doing research collaboratively is the best way for researchers to integrate since it is the experience of actual research which provides the ground for the design of a shared scientific policy. For this purpose Kaleidoscope created the *Jointly Executed Integrating Research Projects* (JEIRP) which were meant to favour the cross fertilisation of the partners research.

The JEIRPs were selected following an internal call for proposal. The selected proposals got a lump sum for a duration of a maximum of 12 months. Since the objective of the network was not to fund research projects as such, the JEIRPs had to be built on top of the research currently carried out by its partners, and focus on nurturing the integration of their strengths and complementarities.

For the last year of the Kaleidoscope contract, the concept of JEIRPs evolved to take into account the budget constraints, and the teams were invited to apply for Seed Grants with more exploratory budgets. These grants had a dual purpose: to extend the initial work of some JEIRPS towards a more sustainable network of research partners, and to provide funding to enable teams in emerging and previously unsupported areas of research to develop a shared understanding of research perspectives and aims.

The following sections report on the achievement of these activities.

2.2.1. The *Jointly Executed Integrating Research Projects* (JEIRP)

Along the three first years of the contract, Kaleidoscope has funded 15 JEIRPs covering a large number of different topics as witnessed by their titles:

- Personalised and Collaborative Trails of Digital and Non-Digital Learning Objects
- Mobile Support for Integrated Learning (MOSIL)
- Conditions for productive learning in network learning environments
- Semantic Web and E-Learning
- Interaction & Collaboration Analysis supporting Teachers & Students Selfregulation (ICALTS)
- Building Visual Interactive Blocks for Tangible Mathematics
- Interaction between learners internal and external representations in multimedia
- environment
- The impact of technology-enhanced learning on roles and practices in higher education
- Interaction Analysis Supporting participants in technology based learning activities
- Design patterns for recording and analysing usage of learning system
- Mobile learning in informal science settings
- Interaction between learner's internal and external representations in multimedia environment
- Technology enhanced public spaces for intergenerational learning (La Piazza)
- Integrated Digital Language Learning (IDILL)
- Learning patterns for the design and deployment of mathematical games

The collaborative and integrated research carried out in the JEIRPs have been significantly productive as witnessed by:
- the number of co-authored papers in international scientific publications: 59
- the number of joint communication at international conferences: 18
- the number of tools made available through the Kaleidoscope common platform: 6 (including typologies, taxonomies, methodologies, etc.)
- the number of prototypes: 6 (such as: Pattern Browser, Intelligent Glossary, Environment for inquiry-based learning for mobile devices, etc.).

JEIRPs also contributed with the organisation of workshops and conferences (10), and they also participated to VDS through the organization of 3 courses or doctoral modules for PhDstudents training.

In terms of sustainability, some JEIRPs have taken initiatives to find resources. At the European level, for example, the JEIRP "La Piaza" submitted a successful project to the EC MINERVA 2006 funding initiative, the JEIRP on Design submitted an application (unfortunately not founded) to the1st ICT FP7 call, the JEIRP MOSIL is going to prepare a contribution for the 3rd ICT FP7 call and has also made a successful JISC proposal on web2.0. At the national level, the JEIRP IDILL submitted a proposal to the French ANR project and established a LearnMultiM German-Greek bilateral programme. Notably, two JEIRPs have had an impact at a national level: the trails JEIRP on the Slovakian doctoral school; and the IDILL JEIRP whose doctoral module has been integrated in the Leuven (Belgium) University doctoral programme.

The opportunity offered by JEIRPs to cross the interdisciplinary boundaries between the different disciplines and research fields was perceived as one of the most important results. Moreover, common to all JEIRPs, the feeling expressed that having the opportunity to develop a short project, building on top of a common research interest, was a great opportunity and this opportunity opened the possibility to elaborate ideas and methods that have constituted a concrete basis for future collaborative longer projects. This was done both within Kaleidoscope (e.g. 5 JEIRPs evolved in other Kaleidoscope KJAs) and outside Kaleidoscope (3 proposals for the 7th Framework Program, 1 Minerva project).

Some of the impact of the JEIRPs has been already identified; however it is very likely that other impacts will come in the near future. As a matter of fact, it is necessary to have some time to reach concrete and valuable results. This observation is witnessed, for example, by the fact that JEIRPs that were operative in the past years, produced (or are going to produce) outcomes in the current year: Trails (operative in 2004) published a book in 2007, MOSIL (operative in 2004) has a book under preparation to be published by Springer, Higher Education JEIRP (operative in 2005) published a Special Issue of Educational Technology and Society in 2007, DPULS JEIRP (operative in 2005) published a Special Issue of the Journal of Interactive Learning Research (JILR) and an other one for STICEF in 2007. It should be noticed that this interesting set of international publications, contributes to raising the profile of different topics within TEL research and to offering scholarly points of reference both within Kaleidoscope and outside. The observed time lag has several meaning. First, it shows that the integration and collaboration process continues after the specific funding period. Second, it suggests that the integration process needs time especially when, as it is often the case here, the joint activity involves activities among teams initially not integrated.

2.2.2. Seed grants

The seed grants were allocated to a variety of projects which could be gathered in two clusters. A first cluster with activities regarded as strategic for the network, especially those which could help to understand how to implement an efficient policy for the design and use of a common technology platform:
- Centralized data repository
- Kaleidoscope Resource Sharing
- Methodology And Tools for Experimentation Scenario

A second cluster with activities targeting specific research areas:

- Efficient Context-Aware Collaborative Learning
- Designing for Technology Enhanced Learning in Museums
- Integrated Digital Language Learning
- Self-regulated Learning in Technology Enhanced Learning Environments (TELE)
- Learning in the medical sector

The seed projects have been successful in that they have met the aims of carrying out valuable activities of research coordination and in development. Indicators of success from the seed projects include identifying key issues and challenges in Technology-Enhanced Language Learning, undertaking a first review of self-regulated learning in TELEs on a European scale, implementing a methodology for online pedagogical experiments, and producing a European survey on methods, techniques and tools for the design of TEL in medical education.

Planned follow-up activities include developing the architecture designed in the Common Data Repository project into an implementation to mediate access to multiple repositories of log data, based on a common ontology, as well as building a research network on self-regulated learning in TELEs (submission of funding proposals)

Given the small level of funding available, and the rather short time between the acceptation of the proposals and the delivery of outcomes, this would appear to be exceptionally good value for money.

2.3. Technological and intellectual infrastructure

The role of a common technology infrastructure in the integration process is essential, but in a field like TEL in which both technology oriented researchers and researchers in social and human science are working, it is essential that such an infrastructure provides also an intellectual platform. Initially Kaleidoscope started with an architecture including a Shared Virtual Laboratory and a Virtual Doctoral School, and at the interface between the network and the stakeholders a set of instruments including the Academy Industry Digital Alliance, the Users's Group and an Advanced Training activity. The history of these components of the network speaks for the complexity of an instrumentation of the integration process. Reacting to the difficulties encountered and taking into account the feedback of the review Kaleidoscope evolved towards a structure including a Communication and collaboration infrastructure which supported most if not all its activities, keeping the virtual doctoral school and merging the interface activities into only one activity, the Gateway. The sections below analyse the history and the achievements of these activities.

2.3.1. The community platform

The Kaleidoscope communication and collaboration infrastructure (CCI) has the objective (i) to ensure the development of a coherent strategy to provide the tools needed for communication and collaboration, and (ii) to establish a workforce to the service of Kaleidoscope at a structural level combining a centralised approach as regards the coherency and a distributed approach for the deployment of the tools themselves. In line with these objectives, CCI has provided an interface between:
- The Network leaders and the Commission via an online management system which handled the gathering and shaping of all the contractual information.
- The Network members themselves, at an individual or group level (within or between Teams, Work Packages, working groups), via personal or group pages, webspaces, mailing lists etc.

- Te Network as a whole and the 'outside' world via the maintenance of a public web site in close collaboration with the Dissemination and the Gateway WPs. A major achievement is the building of the first open archive in Technology-Enhanced Learning: TeLearn (see below section 3.3)

Number of hosted websites: apart from *intranet* and *public site*.

	2004	2005	2006	2007
Number of WPs	27	28	25	20
Content-based + Backbone		22	19	15
Sites CCI		2	9	9
Sites outside		11	8	6
Without site		9	2	0
Groups and initiatives			2	17

+ **TeLearn**

Number of mailing lists created in:

2003	2004	2005	2006	2007
6	15	9	15	10

There is an increasing number of working groups finding the creation of workspace via CCI an efficient and easy support for their activity. The platform works well as a meeting point for the community. Per month, the rate of 5000 distinct visitors per month on Kaleidoscope witnesses this evolution. However, this needed a certain time to build up confidence and understanding of the added value of doing so. The combination of a centralised approach (coherency) and a distributed one (tools) was a challenge for the network. It would have been easier to address it, had the platform and service been available from the project start. However, is it possible to offer a consensual solution before the project really starts and the various needs can emerge? The network and the platform did emerge in close interaction, the former needed the later, but understanding the benefit of the later would have meant the existence of the former. The case of the common platform demonstrates well the complexity and the momentum needed to succeed in building a research network in the TEL field.

An Interaction Analysis tool has been developed and implemented. I is a promising tool, but it was not possible to fully use it within the time scale of the project because of the learning curve of any new technology. As analysed by the designers: "Not being familiar with such tools and not having enough time to do so, it was not always easy to involve the users to a project such as the IA Task and receive adequate feedback, information and comments." It should be noticed that this has been the first attempt to apply Interaction Analysis techniques in order to support the members of a scientific network in their various roles. Due to the size and the complexity of Kaleidoscope NoE, the difficulty of this attempt proved to be quite high. However, such approaches are interesting and very well appreciated by the users in several different cases, once they familiarize themselves with such tools and utilize them at their convenience. There is every expectation that it will be the case for Kaleidoscope.

The issue of sustainability is critical from the beginning of the creation of the platform. It is conditioned by the maintenance and evolution of the platform: hardware (servers and administrator), software (developers), and services (feeding News flow, running Telearn etc…).The natural tendency of the teams and projects was not to join a centralised platform

and the reviewers recommendation worked as a strong incentive to do so. But still the key issue remain, the reluctance to join the platform for web sites, being the fear that its durability will not be ensured beyond the EC funding. A first response to this situation is the decision to make the content management system (Alpha Complex) available as an open source software package which would hopefully find a community of developers and users to live its life.

2.3.2. Emergence of a Virtual doctoral school

The Virtual Doctoral School (VDS) was one of the key components of the construction of the network, targeting integration at the strategic level of the doctoral training; a level of integration which prepares and bounds the future of the field. In the VDS over the four year period *256* PhD students have been involved more than *40* senior researchers.

Three main outcomes of the VDS activities can be highlighted:

1. The analysis of a doctoral TEL program that includes the participants institutions provides the network with a framework and understanding of how the PhD education and training is performed and regulated in different places. There are not many common features for PhD education and training in Europe. It is important to understand that PhD education and training is bound by institutional issues. Moreover, when involved the community has developed an awareness of the interest of multi-disciplinary and multi-cultural views of doctoral-studies; as well as an understanding of the interest of apprenticeship-like activities based on research documents (workshops, summer-schools) as opposed to document-based canned courses. The implication of this analysis led to strong focus on a few significant activities.

2. The PhD course and workshops have taken a state-of-the-art perspectives as premises. This means that the PhD students were exposed to the frontiers and controversies in the fields. The PhD students own institutions provides the basic training, but what is unique to the VDS is that it can provide and organize activities across institutions and the PhD students can have access to top level experts in the field. The students were exposed to the discourse, rules and conventions that are the core for the scientific development in the field and the sub-fields. The scientific rigour were in these course and workshops demonstrated and tested out by the students. To be part of such event has a strong effect on motivation and the development of identity as a young researcher.

3. The third highlight is related to institutional issues. It was basically institutions with well structured and a good financial structure for PhD that was able to take the lead and organize courses and workshops. This means that institutions with a good infrastructure benefited and was able to extend their activities, and include and create access for students from a number of other institutions. The clusters of institutions that took responsibility for the VDS activities will be able to continue their collaboration and with some support include other institutions as well (the TELDA concept).

A lesson learned is that language is still an important issue. All activities were *de facto* organized in English, which is not mastered by all PhD students. Nordic countries and northern part of Europe were much more involved then South or Eastern countries. This has made more difficult for the VDS to disseminate in the network. The language issue is not easy to address since it has both to ensure a better access to *International English* and preserve the cultural and epistemological richness of all of our languages, but it deserves a high priority in any policy to develop and strengthen the TEL European research area.

2.3.3. The search for a technology platform

The Shared Virtual Laboratory (SVL) was one the backbone transversal activities which have been initiated at the beginning of the project. Its aim, inspired by virtual laboratories found in other sciences, was to find the ways and means to support the integration within the network by facilitating the awareness and exchange of the research outcomes. The primary outcomes considered were software tools, documents, models (in the spirit of the Model Driven Engineering), experimental data and tools for analysis of different types of data.

The difficulty to develop the SVL was essentially due to a tension between its function as a service provided to the network, and its scientific stake related to the research questions. To serve these two different goals at once became inefficient. At the same time the new infrastructure for supporting sharing of resources, the CCI platform, emerges very successfully and it was decided to move the service functions of the SVL to the CCI infrastructure.

The research aspects of the SVL have been transformed during year three and four to initiatives supported by seed grants: "Methodology And Tools for Experimentation Scenario", a "centralized research data repository", and an "inventory for research objects".

To target a large community like Kaleidoscope was ambitious, we would argue that the road taken in the last two years through ERTs and exploratory studies supported by seed grants has proven to be effective building blocks when the purpose is to share different types of technologies, documents, data and tools.

2.3.4. The adventure of the dialogue with stakeholders

Ensuring and developing an efficient interface between academic research and the large variety of stakeholders was since the beginning a significant part of the network architecture. The strategic component to achieve these objectives were the creation of three different types of activities meant to be interrelated and to be interacting with all the research units. These activities were the Academy Industry digital alliance, the Users Group and the Advanced Training institute. The objective of the *Academy Industry Digital Alliance* was "to understand how exploitation and commercial aspects will be treated in the Kaleidoscope NoE and foster exchanges between academy and industry". The *Users' Group* had the objective to "organize mutual attention between the world of researchers, the world of industrialists and the world of users (practitioners in the education and training field, be they involved in the teaching profession or involved as human resources management at company level, higher education or initial education level) in order to increase mutual understanding vis-à-vis the different set of values, references and concerns". The *Advanced Training* joint activity was created "to ensure appropriate management mechanisms and form in order to establish and exploit a flexible and sustainable training system for providing researchers and practitioners in e-Learning with knowledge and skills at European and world level of excellence."

To have three different interrelated components at the interface between research units and stakeholders was probably a too complex architecture for a not yet integrated community, although each component had significant examples and cases to demonstrate the relevance of its existence. Then, at the end of the third year this has been simplified with the creation of a "Gateway" which merged the objectives of the three initial actions.

The aim of Gateway is to offer:
(i)   for *stakeholders*, the possibility to access the competences of Kaleidoscope, to relate to its members, to participate in the research or use its outcomes,
(ii)   for *researchers*, the way to get in touch with users, practitioners, vendors, to take into account their needs at the first stages of research and involve them in the co-design of innovative outcomes, thus maximising the impact of their research.

To meet these objectives, Gateway created a strategic instrument: the *Stakeholders club*. This club has constantly grown in the number, scope and profile of individuals members as well as networks, associations, NGOs, enterprises adhering. To date, 159 registered members belongs to the club, including high profile members such as the SURF foundation in the Netherlands. Higher education, school and lifelong learning are the most represented sectors. The stakeholders members and the Gateway have communicated both in presence, e.g. at the EDEN e-learning 2.0 conference, bilaterally in the framework of other events, and also on-line, through the stakeholders website and the blog, as well as mail exchange. Members of the stakeholders club have commented the Kaleidoscope vision and contributed to the formulation of the vision 2.0 statement, they have taken part in the European Awards on technology transfer by providing four case studies (one case study is a joint Kaleidoscope-stakeholders club venture) they have expressed ideas of collaboration with the Kaleidoscope network and they have been addressed to relevant members of the network thanks to a match-making service provided by the Gateway team. More than 80 stakeholders are expected to take part in the second day of the Kaleidoscope final symposium, and their active participation represents a real value added when it comes to enhancing the dialogue between researchers and stakeholders and opening the Kaleidoscope network to the wider world.

The Stakeholders club is also expected to play a key role in supporting Kaleidoscope sustainability. Keeping it "alive" beyond the contractual end of the project as, for instance, a LinkedIN group or a distribution list is not very difficult. There is also great potential for synergies with the overall sustainability strategy of the network.
For instance, the stakeholders club is a fundamental asset of the TELEARC association to be established.

In addition to that, the collection of case studies as well as the interviews with SIG/ERTs have provided new examples of dialogue between researchers and stakeholders and have improved the understanding of users' and stakeholders' concerns, priorities and expectation. The methodology to address research groups has been refined.

However, during the project, we have detected that there are still severe communication problems between the research community and the users of the research results, who include industry, policy makers, as well as end-users. One major aspect seems to be that TEL providers are in most cases SMEs and hence difficult to reach. On the other side, the policy of the Kaleidoscope partners often depends on national and cultural constraints. There is a real difficulty in kicking-off a dialogue, as there is little easy and spontaneous communication between communities which often tend to speak different languages, and refer to different visions and values of the world. Occasionally some researchers in a team might be interested in establishing dialogue, but these initiatives are not often valorised neither brought at a systemic level.

The Kaleidoscope stakeholders club represent an attempt to tackle these difficulties by fostering dialogue and mutual understanding, along the lines of European policies focusing on

open research to stakeholders, such as the recent Green Paper consultation on the formation of the European Research Area (ERA), which called on stakeholders to take responsibility for the creation of the ERA, the establishment of European Technology Platforms (ETP) which group stakeholders together in industry-led initiatives to define Strategic Research Agendas (SRA) for technological fields, the digital ecosystem innovation project[4], the European Network of Living Labs[5], etc.

3. Dissemination and excellence

Dissemination in the context of Kaleidoscope has focused on facilitating partners to engage with the outside world in order to communicate the successes, outcomes and offerings of TEL research across Europe both to raise the profile of research activities as well as of the Kaleidoscope project as a whole. It does not, therefore, focus on integrative processes themselves but rather on providing a story of the results of integration. Case studies, news items and PR relating directly and indirectly to Kaleidoscope activities have been the means to leverage dissemination. The eLearning portal, Checkpoint eLearning, Cordis are examples of multiplier agencies and vehicles whereby information about Kaleidoscope is regularly being hosted. These dissemination actions have significantly raised the profile of the project through PR and Events activities, as recognized by the review team. However, this tangible development and improvement of general dissemination along the contract period must not hide that this achievement has been reached despite an ongoing engagement with members of the network which has been challenging; probably because other work commitments and lack of understanding of the value that marketing activities can have for researchers, research labs and institutions.

The issue of language as in the case of the VDS, is rather sensitive. The communication supported by the Dissemination activity is still largely in English which has limited the impact in Europe. This could be balanced by the creation of a strong network of national contact points and relay centres to build a truly successful dissemination platform

3.1. Scientific legacy

Associated document, Kaleidoscope scientific legacy book: N. Balacheff, S. Ludvigsen, T. De Jong, A. Lazonder, S. Barnes (eds) *Technology Enhanced Learning, Principles and products.* Berlin: Springer (in press)

The third review of Kaleidoscope brought on the fore front, together with the idea of sustainability, the idea of the Kaleidoscope legacy. Working with this idea has led to the decision to produce by the end of the contract period a book likely to present the Kaleidoscope scientific legacy, and to do so with the critical support of the International Scientific Committee (ISC). An editorial board has been established under the leadership of Ton De Jong (Twente, NL), which has invited a group of 20 leading authors, and more than 40 co-authors, to write a chapter that summaries key issues within their subfield of TEL. The draft chapters have been evaluated and discussed during a dedicated workshop in Santiago de Compostella in October 2007 with the participation of the leading authors and the members of the ISC. The final version of the book will be available early 2008, and published by Springer under the title: *Kaleidoscope Legacy: Technology Enhanced Learning - Principles and*

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[4] www.digital-ecosystems.org
[5] www.corelabs.eu, www.c-rural.eu

Products. After a one year embargo, the content of this book will be made available on the TeLearn Open Archive and hence available to all the community.

The different sections of the Legacy book focus on key problems in TEL research.
- The first section summarizes problems and findings in CSCL, Inquiry learning, social and cultural dimension of TEL environments and narrative learning environment, which adds up to what different perspective can contribute with to design of learning environments and how to analyse the use of these environments. This section is concerned with more general issues based on learning theories and design principles.
- The second section focuses on problems in more specific knowledge domains or areas of research (mathematic, science, languages, medicine, science). In all these chapters the relation between design of the environment and how it's used is emphasized.
- In the third section addresses issues in the design of the learning environment, and how users' actions and the results thereof can help create adaptive support structures.
- Section four starts from a technology-driven perspective and aim to tailor the technological possibilities to the educational and pedagogical demands.
- In the fifth section, the chapters go back to more broad issues and problems. Here we explore how computer science and informatics contribute to the TEL field, how we can understand learning with digital infrastructures and artefacts' in a historical perspective and how we implement and use ICT to innovate learning and schooling. .

For each section, members of the ISC will write a two pages synopsis, placing the studies in the section in an international context.

Design and use, and their interactions, are central to the research on TEL. From the enterprise to express the scientific legacy of Kaleidoscope emerges specific considerations on these issues:

Design of environments
In experimental settings the larger technological and learning infrastructure is not visible or needed in order to create progress. However a clear trend is that both this levels (infrastructure and the interactional setting) is part of the research problem. The implication is that in the TEL field the merge between design for the learning activities and learning infrastructure should be seen as one of the most significant directions for the future. This development goes in two different directions, the technological infrastructure capacity for adaptivity to the learner and the broader socio-cultural context which create the motivation and direction for use. We need to understand and create models based on methods that are able to see how the different levels are connected and what it means for learning.

Use of environments
When we investigate the actual use of the designed environment we also need more than one theoretical perspective in order to understand and explain the relation between the technology and the use of it in a social setting. Kaleidoscope started with an important assumption that we need a culturally diverse and rich understanding of TEL in Europe. We would say that this assumption has been deepened and more nuanced models emerge. Both cognitive and social and cultural perspectives have made new and important contributions. They explain the objects of the investigations from different and complementary angles. Without both of these perspectives, we would not be able to understand how new designed environment create effects and mediate learning in specific field of knowledge.

Eventually, the ISC viewed the Santiago workshop as an important and highly stimulating event, which integrates the main contribution from the whole network. Scientific critics were offered in a professional way which will result on the improvement of the different chapters. It was noted that it is important to understand how the subfield develops and what that means for the TEL field as such. The ISC brings a mirror and important reflections on the status and the quality of the work in Kaleidoscope:

> "All the chapters offer creative, new ways to warrant research findings and these elements of the chapters could be substantially enhanced. It would be ideal for each chapter to specifically call out the methods in the main sections." [..] Some promising methods in the chapters: Cross experiments, design studies, iterative refinement [and its importance for all domains], types of case studies selected and articulated and ways to analyze, and forms of assessment used." (quote from an ISC member)

3.2. International impact

Several research units involved in Kaleidoscope and many of the individual members of the network had before the creation of the network a significant presence on the international scene, and often their own network related to our scientific focus. Then, the issue here is not that of the impact of the members of Kaleidoscope, but of the network as such. The indicators for this are not so easy to find, and may be disappointed in the short term, and with was such in the eyes of the reviewers in the first period of the contract. This severe evaluation was reinforced by the fact that the basic policy of the network was to not organise a new conference or a new journal or to create new book series. The analysis is that there is a lot of possibilities already open to the scientific TEL community to disseminate its research outcomes. Much more challenging and possibly with a better return on the long term, to strengthen the presence of the European contribution and presence to existing conferences and in existing journals, especially those with an high level of recognition in the field.

A specific attention has been paid to the involvement of European non member states (NMS) and accessing countries (ACC). Several workshops have been organized which involved a total number of participants 132 (including 33 PhD and master students) from 4 EU-15 countries and 9 NMS and ACC. All workshops were organized as satellite events of the European Day of the Entrepreneur (EDE 2005, 2006 and 2007) and the Third Balkan Conference in Informatics (BCI2007), which helped building new partnerships and cooperation lines. The workshop attached to BCI2007 was dedicated to young TEL researchers and it had 37 participants.

Kaleidoscope activities as such, have been presented to the international community using a large variety of different means: workshop in the context of international conferences (e.g. AIED, EARLI, CSCL, IMCL, etc.), special issues of journals, edited books but also keynotes and invited contribution to participate in international handbooks. There are several evidence of a tangible impact of the Kaleidoscope community at an international level, witnessing the spreading of excellence of the network, including a book series on TEL research has been created by Sense publishers under the editorial responsibility of two Kaleidoscope researchers, and other individual participate in editorial boards of international journals and book series. Aside the case of the European CSCL community which has been strengthened and which is now sharing the international lead of the domain, the case of mobile learning is interesting since this community has emerged in Europe with the support and stimulation of

Kaleidoscope and is now taking the lead at an international level with Mike Sharples who has been elected president of IMCL.

Analysing how it could best contribute to the development of TEL research in Europe and beyond, Kaleidoscope has taken the initiative to create the Open Archive TeLearn. This archive has probably now passed the fragile period of childhood and is about to reach the period of a significant development. The benefit of such a way to share scientific results, already known in other scientific areas, is understood by a vast majority of the researchers and adopted within and beyond the network. The impact of TeLearn is a tangible and major result, for which we have been able to ensure sustainability for the basic services. The implementation of the archive has made more obvious the issue of quality in the TEL research field.

A lesson learned from the constant insistence to demonstrate excellence to the review team, and from having to deal with the fear of researchers to have their publications in an open archive (which has no quality control), is that the community needs to have an explicit policy. If not, it is very likely that the responses to quality issues will come from the outside in a manner and be very likely contingent to instruments and criteria applied to our field without considering its own scientific specificities. For this purpose a Scientific Quality Committee (SQC) is being established, composed of internationally recognized researchers from within and outside Kaleidoscope. This committee will work out recommendations for the TEL-area.

Eventually, to strengthen Kaleidoscope by ensuring a continuous feedback on its development, an International Scientific Committee (ISC) was established with outstanding academics from outside Europe. The ISC has served by evaluating activities submitted for funding in internal competitive call, and is participating in the shaping of the Kaleidoscope scientific legacy by providing suggestions and critics. The committee has been asked to give highlight and lowlight about Kaleidoscope based on their experience and involvement with the network. Here are the results:

Highlights
1. Formation of effective, productive partnerships that included people who had not previously collaborated.
2. Development of creative, new research methods and new synthesis techniques for combining findings such as design studies, innovative assessments, and cross experiments.
3. Establishment of powerful open source technological innovations.
4. Raising awareness of TEL issues on the European level and beyond since Kaleidoscope has been highly visible
5. Efforts to provide the community with stronger theoretical/philosophical bases for what has been achieved and is planed to achieve
6. Identification and re-definition of new research fields/topics such as narrative learning and large-scale educational resource sharing
7. Successful formation of interdisciplinary teams of researchers working on questions that could not be answered without such cooperation. The attempt to bring together divergent ways of thinking about technology enhanced teaching/learning through the creation of a a) researcher community and b) enabling structures (ERTs etc) can be considered a pioneering and critical contribution towards the consolidation, development and future sustenance of TEL as a field of enquiry. This is the beginning.

8. International partnerships that expand the TEL scientific community beyond traditional networking venues (i.e. Conferences where we share knowledge). The Kaleidoscope partnerships have concrete products and resources that can be built upon with future funding.
9. In its long term impact, the creation of Telearn is the single most important, inclusive and sustainable attempt towards creation of community and consolidation/sharing of research activities beyond the boundaries of conferences, meetings and nations.

Lowlights, improvements are needed on...
1. Converging on a common framework for viewing teaching and learning.
2. Scaling innovations to large numbers of students, teachers, and schools. Need more clarity on the scalability and generalizability (across socio-cultural-economic contexts) of research findings so that the context of their applicability is well understood. Or put more broadly: Need structures/processes for enabling a mutually supportive relationship between TEL researchers and teaching-learning practitioners so that research findings and innovations may inform and inspire practitioners and vice-versa. This symbiosis is critical to future research in this field.
3. Finding a better way to make research outcomes more visible and reachable from outside, including the results of empirical studies conducted in classroom settings.
4. Seeking a sustainability model for continuing to enhance interactions within individual communities of various research themes and across these different communities as well as to foster formation of communities of emerging researches. Given the amount of time it takes to develop a Kaleidoscope community an equal amount of time needs to be dedicated to sustainability.
5. Reduction of coordination/administration efforts; development of management structures that are appropriate for a loosely coupled, widely distributed research network.

These reflections and comments from the ISC emphasize a few main aspects. Beyond any doubts, Kaleidoscope has been able to organize the TEL field so it becomes visible and profiled in the international context. This is demonstrated by Kaleidoscope as such and by instruments like SIGs, ERTs and the TeLearn archive. The theoretical basis of the field were strengthened at the same time as new trends that emerge based on the technological development were integrated. This is crucial for the scientific progress of the TEL research and for producing models for field of practice. For the lowlight it is the long term development with different groups of stakeholders that is at stake. Here institutional mechanism could be developed in relation to others instruments at the EC level.

3.3. The TeLearn archive

The Open Archive Initiative is an international movement, initiated in the early 90s by physicists, which aims at ensuring that researchers will be able to share openly, freely and reliably the outcomes of their work. This movement has been successful in physics, the founding discipline, as well as mathematics, biology, etc. The key of the success is the open access to the scientific literature, and the efficiency of the dissemination of the recent work all this compared to the slow pace of the classical media and their cost. Kaleidoscope has taken the initiative to build such an archive, TeLearn, which adds to the above mentioned characteristics the fact to be first international OA being multidisciplinary and multilingual.

Based on the experience in the French context, the initiators of TeLearn knew that this creation would be a challenge since there are special resistances in the Social Science sector to adopt the OA. However, it is also known that passed a certain threshold the adoption grows very fast. Then, the indicator of success of this initiative of Kaleidoscope is quite naturally first the evolution of the number of upload and of download of the resources.

Number of resources and institutions in Telearn:

	June 06*	Dec 06	June 07	Oct 07
Publications	110	254	500	804
Video	-	75	82	118
Affiliated institutions		114 (Kaleidoscope)	132	140

* Initial upload of files by the CCI team to initialize the repository

The use of TeLearn is evolving quickly and has reached a significant level. On the period from December 2006 (opening) to October 2007, the average number per month of publications downloaded is of 2064 (total of 22704 downloaded). The evolution is illustrated by the diagram below:
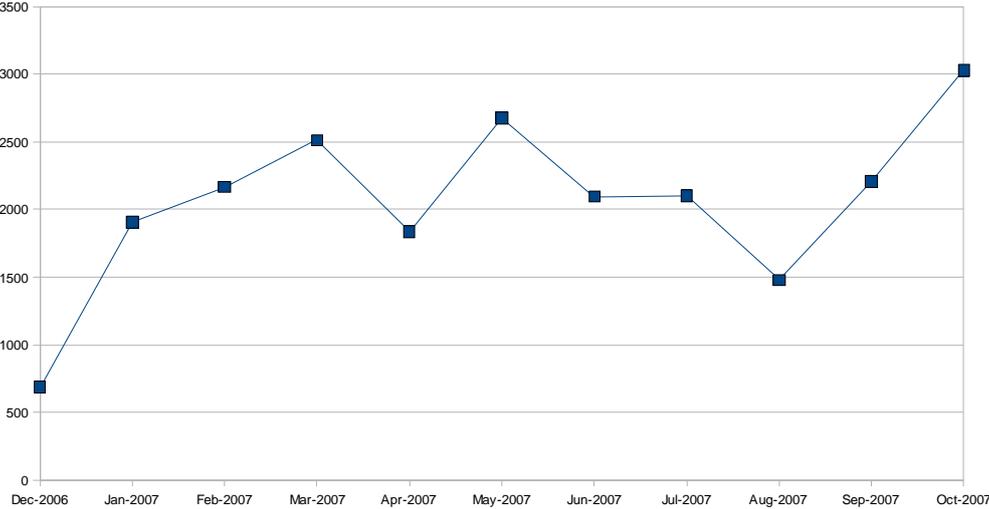
The next diagram shows the evolution of the average number of different (unique) users and visits per months:
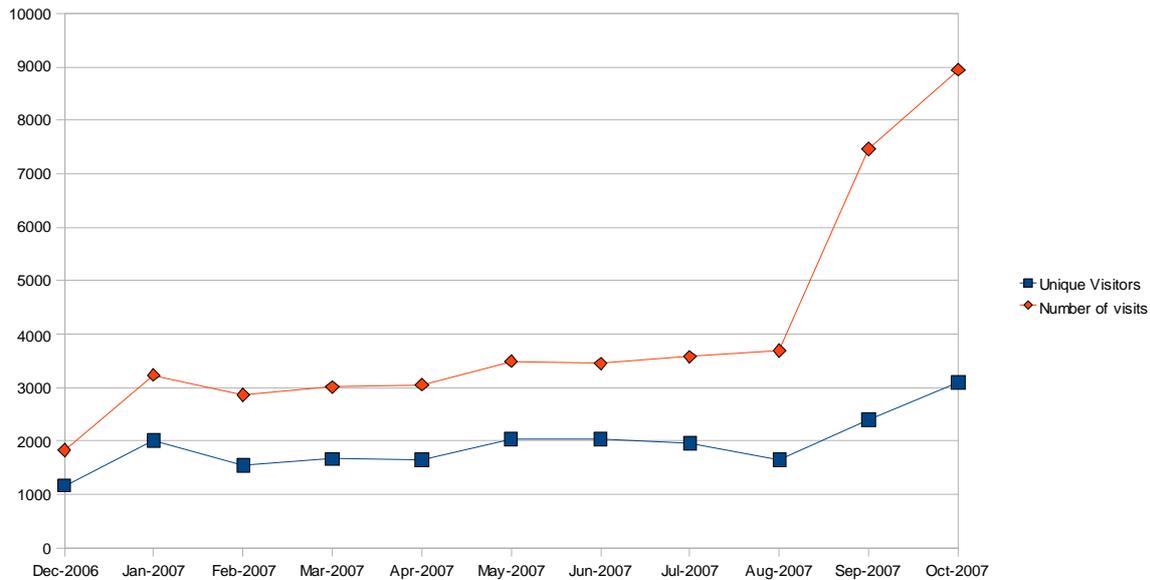
The next other diagram shows the origin of connections. The evolution of the curve "Direct access / Bookmark" shows that increasingly people appropriates TeLearn website by typing it or by putting it in their bookmarks. The growing curve of "Search engines" shows that increasingly engines return a TeLearn webpage.
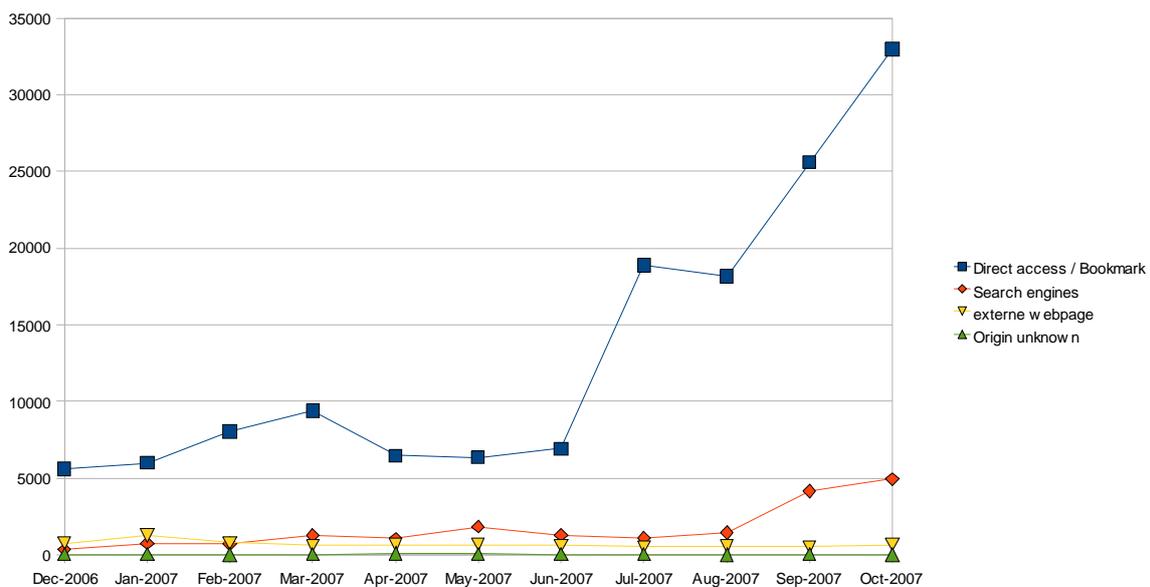
Other indicators show that TeLearn is likely to confirm this evolution and be one of the significant outcomes of the contract period of Kaleidoscope. Qualitative indicators confirm what the above quantitative indicators suggest. Important international centres have affiliated, among which the Stanford center for innovation in learning, SRI International, CRCS India. One of the oldest in most renowned journal, Artificial Intelligence in Education, has joined. More than 80% of the archive is made of reviewed documents (peer-reviewed communications, articles, thesis of book chapters), what means that the issue of the quality of what is accessible is no longer a concern. However, this means that the uploading of pre-print, which is the rule in other research sector, remains here quite rare: the issue of ownership is not completely clarified. If TeLearn is fully multidisciplinary, as witnessed by the keywords, the opening to any language has had a limited effect: 81% of the papers are in English, 16%

in French, the rest include Italian, Spanish, Dutch, Bulgarian, Danish and Portuguese with percentages which do not reflect the activity of these communities.

The sustainability of the TeLearn repository will be ensured by being hosted by the CCSD, a French service unit for OA from the CNRS. This will concern only the text based documents, not the video and the digital resources. The sustainability of the specific services (other than upload, generic indexing, search and download) currently proposed by TeLearn depends on the Kaleidoscope sustainability itself.

4. The review-project synergy

4.1. Convergence and misunderstanding

The idea of the Network of Excellence was is great innovation of the European R&D Framework Programmes. It was promising, and immediately seen as an exceptional opportunity to structure at a high level a field of research until then very fragmented either along scientific lines, or because of the local tropism of research in education. Indeed, researchers on TEL, especially those who take the lead of this project, have significant professional experience of working as members of a community and at an international level. But in a field largely dominated by North America, as it is the case for the technological infrastructure (thanks to an industry having an international dimension and US roots), the tendency was—and is still—rather strong to look overseas and forget the continental development. The proposal of the NoE was timely. The project submitted to the Commission had for driving force the objective of establishing a robust intellectual platform, an incentive to scientific integration and the ambition to raise the profile of European research at an international level and vis-à-vis the stake holders. The proposed initial organisation of Kaleidoscope reflects this ambition. It was a challenge since neither its components existed before or had the research units any common tradition of collaboration, or if the case it was in limited clusters.

The history of these four years is that of the construction of the network in interaction with a process for understanding what to be a Network of Excellence means, and what integration means in the TEL research area. It is also the history of the interactions between the consortium and the reviewers team and the project officers. What is a NoE was not precisely understood from the beginning, and any effort to understand it was biased by the tradition of the R&D projects which we have learned to organise and manage in a structured and timely way. This claim applies to the researchers as well as to the reviewers. For the former, it was easier to understand how to engage in a common research action than to envision a common scientific policy for the long term; for the later there were a tendency to make an evaluation at a content level more than on the integration process itself. These tensions were visible when the network was reproached for being too inward looking, for having "a lack of clear vision of authority and responsibility", and for having achieved enough on the building of the common instruments. All this led the network to questioning itself, and to evolving year after year in a movement aiming at keeping the seminal ambition but taking into account the way it was challenged.

However, it must be acknowledge that the foundational objectives of the project were clearly identified, as expressed in the first review report. "*Kaleidoscope* is a Network of Excellence project that aims to (1) integrate existing research concerning the use of digital technologies in learning and teaching and (2) develop new tools and methodologies to facilitate European-

wide interdisciplinary research focussed on this topic" (1). But what was missed is that most of what was intended did not exist, in any form, from the beginning and had to be built. The following paragraphs will account for the main problems encountered and the evolution of the network along the period.

Steering, authority and leadership
Part of the difficulty in understanding the steering structure of the network comes from the fact that it was described in operational terms in the Consortium Agreement which was a document not shared with the Commission. A network is not a technological project or an administration, but a community in search of a viable organisation which can only emerge from mutual agreement and recognition. This is a condition for sustainability. The Consortium Agreement provided a framework, but the rest had to come from a consensus on a hierarchy and distribution of the responsibilities. This has been mostly achieved by the end of the contract time, where the steering of the network is no longer in the ends of the activists of the first hour but of scientists who have been elected: the scientific manager renewed in 2006, and a completely renewed Core Group after the partial renewal at the end of 2005 and 2006. The Executive Committee and the different task forces, whose activities the reviewers asked relevantly to formalise more, represent an efficient and sustainable structure for leading the community. One of these task force, the *Scientific Quality Committee*, will be instrumental to lead the network on a content basis, what count most. The argument to support the claim that this steering structure will be effective is that we succeeded to have candidates and an effective election during the contract period for a duration which goes beyond it.

Existence, impact and openness
The question of the impact of Kaleidoscope and of its enlargement, although this NoE was already large, have been raised right at the first review. The reproach was that the network was too inward looking, and not demonstrating the impact of its excellence. One may see there an important misunderstanding of the purpose of the contract itself on both sides, the network consortium and the review team. On the side of the consortium, most researchers had a tendency to consider that because the network didn't financially support directly actual research, then the research outcomes had not to be reported as such. However, it was clear, because it is vital to the research units that all members of Kaleidoscope were very active scientifically and proactive to disseminate their results. Hence the impact of Kaleidoscope researchers outside the network was hidden by a default of reporting. On the side of the review team, it was missed that the network had to exist inside before it could outside as such and moreover have an impact as a network. The integration of research units which were not collaborating initially is a process which needs time, and then time is needed to see the effects. One can see at the end of the contract that *Kaleidoscope as a network as an impact*, in several different ways which are analysed in the preceding sections of this document. It must be emphasised that Kaleidoscope didn't choose to add more conferences or create more journals or book series, as the field is already populated with too many—what may contribute to a level of quality often average. But Kaleidoscope was proactive in ensuring its presence and impact in existing events, or via special issues of existing journals or book series. Indeed, the time needed between the emergence of an integrated community and a publication witnessing its contribution, is at least of four years and in general more. However, Kaleidoscope has been proactive in an original way in a sector until then left empty although it has a huge potential for the future: the Open Archive Initiatives. The penetration through the SIGs in existing scientific organisation, the establishment of multilateral agreement for the ERTs, the emergence of scientific vision which is shared, the creation of an association of

research units, are major achievements which needed time and effort in a way which was underestimated.

Infrastructure and community building tools
The issue of having a network infrastructure was one of the two most difficult to address. If a priori to have such an infrastructure seems common sense and, so to say, seemed "on the paper" quite obvious, it eventually proved to be one of the most delicate challenge. The infrastructure could not exist before the network itself and without understanding its needs and constraints on uses, but it was instrumental to the existence of the network as such. To develop such an infrastructure and the sharing the diverse tools triggered some of the basic tensions in a research community. Research communities are communities because they share, but also a strong competition is part of the research activities, and more and more in a marked driven way. Infrastructures and sharing tool, documents, data, and methods for analysis are also part of the institutional mechanisms. This means that institutions operate and are accountable in specific ways. A shared research infrastructure across laboratories challenges the institutional accountability, since the sharing of resources is related to ownership. The individual researcher can only partially work on such problems. So, as a typical example, we do not see the problems with the SVL as a phenomenon that can be reduced to reluctance or resistance only. Such an infrastructure challenge basic norms and operational modus in the research system.

This does not mean that researchers are not aware of the need and benefit to share their technology outcomes and data, their commitment to two joint actions on these issues witnesses it. But the process is slow because changing behaviours and appropriating new instruments is slow and cost a lot of effort and money. However, the proposition of the review team to create a Kaleidoscope "Communication and collaboration infrastructure" has been very productive in clarifying the conceptual and the technological dimension of the Backbone. The rate of adoption of CCI by the community is quite good, and the fast development of the TeLearn open archive demonstrates that there is room for success on this mutualisation of research outcomes and hence community building on a significant scale.

The introduction of "facilitators" in the functioning of the network, suggested by the review team, has been an helpful initiative. The two facilitators appointed late 2006 and for the whole 2007, did enhance the communication within and beyond the network. Concrete outcomes of this activity are the production of summaries of scientific Kaleidoscope activities for Gateway, the analysis of impact of the VDS PhD, the organisation of joint events between KJAs, and the facilitating the use of TeLearn. However, the task was challenging because the researchers did not understand immediately that this was a possible resource. Interestingly, not only did the facilitators support integration, but also they allowed perceiving the integration process as it works; to quote one of them: "many things are already ongoing, but hidden in the bulk of other activities".

Stakeholders and knowledge economy
What could be the Kaleidoscope business plan? How could the network transfer to the stakeholders and impact users and the market? These questions were quickly raised by the review and created quite a turbulence in the network life. The fact that such issues cannot be addressed properly before the network itself had taken shape applies here again. But this was possibly not the main reason for this tension between the consortium and the review team all along the three reviews. It had been clarified, when answering to a review report, that Kaleidoscope had no objective to exploit commercially its outcomes but aimed at developing

the interface to support exploitation by Kaleidoscope contractors. Many Kaleidoscope contractors are successful in transferring products to the market or in establishing relationships with the users; the point is that this is done mainly at a regional level. The challenge is to enhance this potential by offering to Kaleidoscope contractors' access to a European-wide visibility and possibly further developments. This is on the agenda of the Kaleidoscope gateway and the Stakeholders club.

4.2. Adaptation and fidelity to the foundational spirit

The evidence of the transformation of the project Kaleidoscope, the project here seen not in contractual terms but as it was thought by its founders, resulting from its adaptation to the reality of the interactions within the network and with the review team, raises the question of the transformation of the objectives themselves.

Concerning the structure, the following pictures show what Kaleidoscope has envisioned initially and what it is at the time of the writing of this document.
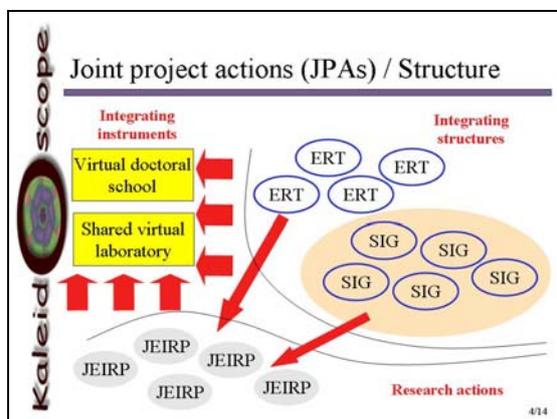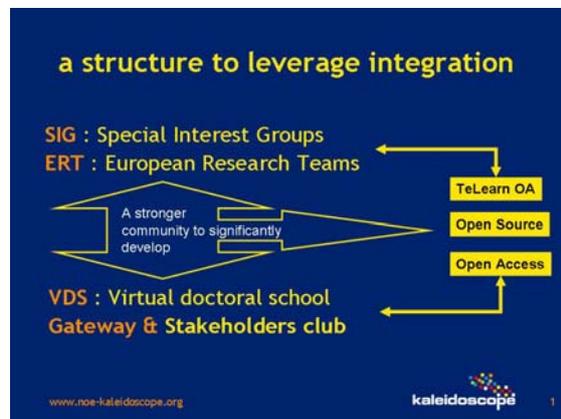
2004   2007

The simplification of the construction will facilitate the sustainability of the structure. The JEIRPs have been replaced by the seed grants, a model which could be kept in a lighter project as it is less costly; it is now understood that an integrative project adds value and leverage the competence but does not replace the role of the funding bodies for "real" research projects. The Virtual Doctoral School is confirmed in its key role in the integration process. The interface between the research community and its users has found a clearer place with the Gateway, and instrumented with the creation of the Stakeholders club which is a strategic piece to enhance our capacity to impact economy and fulfil the social needs. All this can work if based on an efficient and robust technology based infrastructure which appears on the right hand side picture through its services. The willing to continue the integration process is demonstrated by the commitment to the creation of an association, TELEARC, which will maintain a framework for the integration of the research units policy. The main problem to address in the next period is that of the financial viability of the communication and collaboration infrastructure.

Intellectually, the progress is in line with the initial expectation, although identifying what the different sub-communities on what converge or diverge was not straightforward. By the end of the contract the production of a Kaleidoscope scientific statement, the emergence of the Quality Scientific Committee, the production of the Kaleidoscope Legacy book are, aside the integration at the SIG and ERT level, evidences of the existence of a more and more coherent

scientific community. This does not cover yet all the TEL research area, but a significant part of it, and there are expectations that the dynamic created will continue and enlarge its scope.

To summarize: the foundational spirit of the project has been preserved, and operationally strengthened.

4.3. Cost and efforts, a critical analysis

The Kaleidoscope consortium has received a grant of 9.350 MEuros to support on four years its scientific integration and structuration. This money has been distributed each year depending on the evolution of the JPA, a budget being allocated to an activity following a proposition of the Core Group confirmed by the General Assembly of the Contractors. Then, the budget of each contractor is the sum of what is received through each of the activity in which it is involved.

Two questions frequently asked are that of the case of the partners receiving a low budget, and that of the cost of the project including what is not covered by the grant. The diagram reproduced below provides elements[6] to respond to these questions. This diagram is based on the information available about the money received (yearly allocation by the project) and spent (accepted cost statements) during the first three years of the contract (the cost statements for the last years are not yet known). Then, the two following comments are well supported by the diagram:
- first, the Kaleidoscope partners have significantly spent more money than what they have received, and so actively supported the integration process
- second, this is the case even of partners having received a low budget. These partners also invested and sometimes in a quite significant way compared to what they received (the consolidated diagram does show the different situations precisely).

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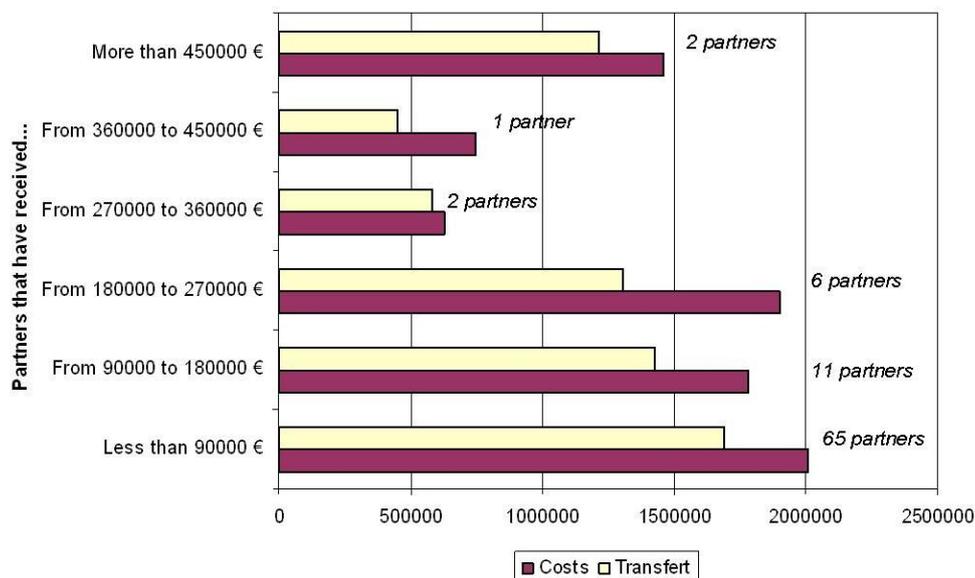
[6] On this diagram the two partners on the first line are the CNRS and the LKL. The former was in charge of the general scientific steering and the CCI including TeLearn as well as some scientific activities. The later had steering and scientific activities and Dissemination. Then comes the University of Twente and the University of Sofia.

The case of the effort spent illustrates the kind of relationship researchers developed with the administrative part of the project: it was difficult to obtain that all individual researcher reports precisely on the effort spent for Kaleidoscope. This difficulty had a radical consequence with the closing of the SIG Context. The production of the cost statements is managed by the contractors administration which also register the effort spent, but many researches tend to neglect taking the time to upload this information on the project database so that it can be recorded and use.

The table below shows the contrast between the two first years and the third year in this respect.
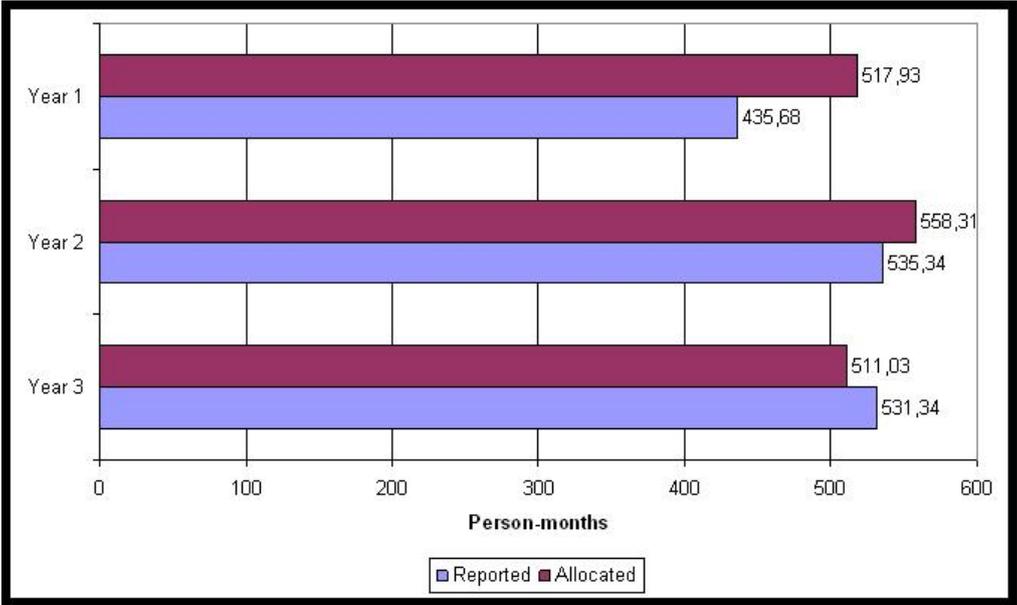
The effort reporting concerned 58 contractors in the year 1, who had received a budget, out of that 10 contractors did not fill the forms. For year 2 the numbers are respectively 62 and 14. The situation in year 3 is better, the reporting being of a better quality of those who reported but still 13 contractors out of 66 did not report to the network.

There could be a number of reasons for the lack of reporting on the effort spent including: (i) there has not been sufficient internal coordination between the academics and the administration, so that the administration is not aware of the need to register effort, (ii) the Kaleidoscope funding is considered to be so small that it is not worth the effort to upload the information, (iii) there is a genuine communication problem between Kaleidoscope and the administration, such that the administration thought it had provided the information, and was not aware of the need to upload it in that form, (iv) the administration is lax. In terms of lessons learned, for small amounts of funding, where there is substantial additional effort, then there needs to be a very "light touch" administration. Each institution needs to make a cost-benefit analysis of being involved in a NoE, both at the academic level and the administration level. It has to be worthwhile *both* for the academic and the institution administration to be involved. So a lump sum would make it attractive for administration, and a simplified and clear reporting process (e.g. with deliverables that have academic value) would make it more attractive to the academics.

Additionally, there were often a difficulty to make a priori a good evaluation of the effort to be spent on integration, this phenomenon increases the gap between the effort provisionally announced and the effort effectively reported. The situation is much better on year three.

The effort spent was proportionate to the means and adequate for the achievement of the workplan. But it is more difficult to have a good evaluation of effort in an integrative project than in a R&D project. The former tends to be "chronophagic" for tasks which are more difficult of "calibrate" and in general more peripheral for the latter (writing of essays and research reports, meetings, coaching, etc.)

5. Conclusion: lessons learned

This document highlights a number of indicators of the effectiveness of the strengthening of the TEL research area in Europe due to the policy and activities Kaleidoscope has deployed along the fours years of the FP6 NoE contract. There are also good indications that this strengthening of the field will have a long term impact. The only international programme which has given a comparable impulsion to the field in the past is the NATO special programme on educational technologies—more than fifteen years ago. This gives an optimistic view for the impact of Kaleidoscope in the long term. Some lessons can be learned from this four years history. Many of these lessons have been mentioned along this document, the following paragraphs provide a more global view and synthesis.

- *A condition of success of the endeavour is a better understanding of the differences between what could be called "R&D Projects" and "network and integration project"*

The tension between the two foci was present from both an institutional and an individual perspective. It resulted in uncertainties about what should count if the evaluation would not include the actual research. A corollary was another tension, the one between building common structures and scientific integration at a content level (see also the annexed tables). Hopefully, some partners initially interpreting the project as a source of funding for research, ended up understanding the value of integration and are now engaged in this process. Time and communication are keys to the success of this new and worthwhile instrument.

- *The issue of educational and /professional traditions have an important weight on the integration process*

Kaleidoscope is a place where computer scientists and engineers, psychologists and researchers in social science met. The "end" point of development for their traditions is in many ways different. To make the difference sharper, one may claim that for the computer scientist the end point is the new environments and representation that can enhance learning, while for social science and human science the end point is the actual use and the learning processes and results. In Kaleidoscope the different instruments have succeeded in blending the different competences, but to build a common vision more than for a common product proved to be much more difficult. New "boundary objects" (e.g. learning trails, educational data mining, and self-regulated learning) provided points of convergence for the actual design of a new representation, while the technical specification is further from a computational perspective and the empirical design and analysis of data is brought forward by the "learning scientist". These developments involve different temporal sequences, but if the leadership is strong the results move beyond each singular contribution and become a contribution to the TEL community.

- *Integrating and structuring a research community is a process which needs time, this must be included in the way the reviewing of the enterprise is designed*

The adoption of the founding concepts needs interaction and the possibility to transform them, the time base for the learning curve is counted in years, not months. The review process, its preparation and follow up periods, created break points in the progress of the project. The energy and time needed to both take into account the recommendations—several being relevant—and argue on those which seem to reflect a misunderstanding can be seen as slowdowns. It is true that the review contributed to a better shaping of the project, but at a cost which could have been lowered. A suggestion would be to have reviewers much closer to the network activity although this raises possibly practical and deontological problems.

- *The equilibrium between community building and individual recognition is fragile, it can be strengthened only if the former serves the later rapidly in a verifiable way*

Several SIGs or ERTs experienced the difficulty to invest in an activity when the immediate return is not evident. This puts a limit to individual commitment which is difficult to manage. However it could be considered as a kind of bootstrapping effect. Still, the evaluation of the correct balance between individual and collective interest is not obvious. Unlike some other domains, it is not obvious to identify the "incompressible" cost which researchers and research teams would have interest to share, while on the rest they are competitive. A starting point is the strategic level of sharing the means for a better scientific dissemination. This is central to integration, and it was a success of Kaleidoscope to demonstrate that the pooling of knowledge by means of the common website and the TeLearn archive can have a significant added value. The same applies to VDS which allows the finding of expertise complementary to local competences to enhance PhD training, or even the continuous training of senior researchers.

- *The reporting and reviews weighted too much on the integration process, more generally a process must be found to lower the focus on organisation to the benefit of a stronger focus on scientific achievement and integration*

A possible metaphor could be that while and R&D project is focussed on its intended tangible outcome, an integration project generates activities which soon are dense everywhere in the researchers agenda, and which actual implementation and specific aims could evolve during the process itself. A network targeting integration must be flexible and reactive. So the reporting on the effort can become a much more effort consuming task than for a R&D project, and the rigidity of the workplan may prevent innovative initiatives to develop the integration. A suggestion would be that the grant shall take the form of a lump-sum being paid periodically according to the assessment of the progressive implementation of the JPA. This assessment can be done through the measurement of integration based on performance indicators negotiated with the consortium.

- *Sustainability is a challenge at a national level which can be successfully taken up only if the uncertainty about the policy of the Commission is clarified*

The integration at a scientific level is effective in most of the activities Kaleidoscope has engaged as the result of a process which cost was only partially covered by the grant. In the TEL area this cost is rarely associated to an immediate tangible benefit, which seems to be problematic with the time scale within which decisions must be taken nowadays, especially if other possible resources appear at a national or EU level. In short, integration at an institutional level is very challenging on a four years period. First the institutions

have to observe that the initiative at the researchers' level is successful in scientific terms, second they need to check what would be the return on their possible investment, and finally they must consider if the policy of the commission itself will be positive toward this type of organisation. The VDS case is a good example: in four years it has reached a point where the concept is proven, and then adoption depends mainly on decisions at institutional levels.

- *The structuration of the European TEL research area must be multilayered, providing an incentive beyond the excellence centres by direct involvement of research units*

Research on TEL is so dependent and rooted in the education and training history of the member states that any significant integration of the research field must be based on a large membership; it was clear that the difference in cultures on what count as good scientific practice in the field is essential and is linked to cultural and epistemological traditions. To restrict arbitrarily the membership, beyond ensuring a certain academic standard, would have isolated a few and not made any difference at a European level. Still, only players with institutional leadership have been able to ensure a key role in the work in order to structure the field. This means that the field must continue its structuration with different levels, at the kernel excellence centres likely to ensure the sustainability of the common instruments and as affiliated those research units which are significantly involved in developing the field.

- *The policy towards SMEs, which are the keystones of educational technology in Europe, must be much more proactive and needs specific means*

All the efforts of Kaleidoscope to reach the TEL stakeholders has been an occasion to learn how much the TEL market is fragmented when leaving aside general technological infrastructure (either material or software) and dealing with issues closer to the user/consumer world, as well as the actual learners, teachers and trainers. Here, SMEs are key players because of the better knowledge of the local needs, social and economical conditions. But at the same time because of their size and financial strength they are enterprises for which accessing R&D is the most difficult. A proactive and specific policy is needed in this area. A study of what has been successfully done by the research units locally can inform this policy in the TEL sector.

Annex 1

We want to summarize this "Impact and lesson learned" analysis by a comparison of the "network" as an instrument with a "project" which is the most common instrument used for steering and regulation of research in the TEL area. The comparison is based on a few key dimensions which have been important in the development of Kaleidoscope, NoE. First we do a more general comparison, then we describe the impact and lesson learned from a Kaleidoscope perspective.

Projects	Network
Common goals	Goals related organization, community and infrastructure of fields of knowledge
Products and concepts	Re-organized community – and new subfields
Milestones and deliverables in order to demonstrate necessary progress towards concrete products	Regulation of processes in order to demonstrate progress towards reshaping of the community
Key issue: deadline	Organization versus scientific report
Leadership driven by goals, products and concepts	Leadership driven by ideas, organization and new boundaries
A priory defined plan for structuring the workflow	Only partly a priori defined plans for work; key issue emerging and uptake of new trends
Focussed scope – short duration 2-4 years	Wide scope – duration - infinite
Indirect structuring of a field	Direct structuring of a field
Accumulation and impact - products - Concepts - scientific uptake	Accumulation and impact - structure of the field - substructures of the field - scientific uptake - scientific policy - Long term vision
Size: varies from 3-4 up to 20….	Size From 10-85….
Membership: individuals supported by institutions	Membership: institutions that engage individuals
Degree of participation: Constraint by allocation and short term achievement	Degree of participation: Interest, values and long term vision
Benefits: Resources in order to increase research capacity	Benefits: strengthen community in order shape the long term vision
Integration mechanism: products and concepts	Integration mechanism: communities, sharing scientific policy and objects of inquiry

The TEL field is highly interdisciplinary which means that too define one clear scientific kernel is not possible or adequate from a scientific point of view. Instead we must look at the relationship between the subfields and their development and what are the aggregation

mechanisms' for the defined field. In addition we will argue that the impact should be judged from the key dimensions listed in the above table.

Kaleidoscope as NoE – the Impact

Network	Kal Impact
Goals related organization, community and infrastructure of fields of knowledge	Overview of the field, strengthen communities, new communities, restructured subfields, emerging key institutions and individual researchers National programs
Re-organized communities – and new subfields	Multiple fields: More scientific rigour should be achieved – which could also increase the connection between subfield, and the generalized research outcomes
Regulation of processes in order to demonstrate progress towards reshaping of the community	New collaboration partners across SIGs, reshaped sub-fields (ERTs)
Organization versus scientific report	Less focus on processes and organizational issues and more focus on scientific achievement
Leadership driven by ideas, organization and new boundaries	The steering instruments could be improved to connect the leaders of the different instruments and the whole network in order to improve vertical and horizontal structures
Only partly a priori defined plans for work; key issue emerging and uptake of new trends	The work with local innovation should be emphasized more and legitimized by the EC – innovation hardly happens at a European level, Scaling as key issue
Wide scope – duration - infinite	Key dilemma – few strong units versus few strong and leading units and strong individuals – empirical fact: around 30 unit did participate with commitment in Kaleidoscope …
Size from 10-85	To many – need for a more differentiated structure
Direct structuring of a field	New SIGs, strengthen of old sigs, new strong collaboration, The structures and workformats of doctoral training
Membership: institutions that engage individuals	Institutional leadership and PhD students Problem: transformation of leadership
Degree pf participation: Interest, values and long term vision	Communities with strong and weak ties
Benefits: strengthen community in order shape the long term vision	The relation between sub-fields and the field as such, capacity to reshape and build consortium in a sustainable way
Integration mechanism: communities, sharing scientific policy and objects of inquiry	Long term integration through diverse set of means, projects, association …

Annex 2

Kaleidoscope 2007 Governing board

Scientific manager

Ludvigsen Sten, Intermedia Oslo, Norway

Core group

(a "*" indicates the members of the Executive Committee)

Balacheff Nicolas, CNRS - Centre National de la Recherche Scientifique, France
Barnes Sally, University of Bristol, United Kingdom
Blake Canan, The Open Univeristy, United Kingdom
Bottino* Rosa Maria, Institute for Educational Technology (ITD-CNR), Italy
Burgos Daniel, ATOS Origin, Spain
Dimitrakopoulou Angelique, University of the Aegean, Greece
Dimitriadis Yannis, University of Valladolid, Spain
Dirckinck-Holmfeld Lone, Aalborg University, Denmark
Dondi Claudio, Scienter, Italy
Laurillard* Diana, Institute of Education, University of London, United Kingdom
Lindström Berner, Göteborg University, Sweden
Magli Rossella, Campo Rosso, Belgium
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Schoonenboom Judith, University of Amsterdam, Netherlands
Sharples* Michael, University of Nottingham, United Kingdom
Tchounikine* Pierre, University of Le Mans, France
Turcsanyi-Szabo Marta, Eötvös Loránd University, Hungary
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Wasson Barbara, University of Bergen, Norway

Kaleidoscope Joint Activities Leaders

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Advanced Training Institute
Nikolov Roumen, Sofia University "St. Kliment Ohridski", Bulgaria
Stefanov Krassen, Sofia University "St. Kliment Ohridski", Bulgaria
Artificial Intelligence and education
Harrer Andreas, Universität Duisburg-Essen, Germany
Building Visual Interactive Blocks for Tangible Mathematics
Kalas Ivan, Comenius University, Dept. of Informatics Education, FMFI, Slovakia
Computer Support for Collaborative Learning
Fischer Frank, Knowledge Media Research Center, Germany (then University of Munich, Germany)
Computer Support for Collaborative Learning
Wasson Barbara, InterMedia & Department of Information Science and Media Studies, University of Bergen, Norway
Computer Supported Inquiry Learning in Science

de Jong Ton, University of Twente, Netherlands

Computer-based Analysis and Visualization of Collaborative Learning Activities
Harrer Andreas, Universität Duisburg-Essen, Germany

Computer-Supported Scripting of Interaction in Collaborative Learning Environments
Weinberger Armin, Knowledge Media Research Center, Germany (then University of Munich, Germany)

Conditions for productive networked learning environments
Dirckinck-Holmfeld Lone, Aalborg Universitet, Denmark

Context & Learning
Figueiredo Antonio, Faculdade de Ciencias e Tecnologia da Universidade de Coimbra, Portugal

Design patterns for recording and analysing usage of learning systems
Choquet Christophe, Laboratoire d'Informatique de l'Université du Maine, France

Digital Language Learning: An Integrated Perspective
Granger Sylviane, Universite catholique de Louvain, Belgium,

Dissemination
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Walker Kevin, Institute of Education, University of London, United Kingdom

Interaction between learner's internal and external representations in multimedia environment
Demetriadis Stavros, Aristotle University of Thessaloniki, Greece

Equity and Ethics
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Learning GRID
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Learning Patterns for the design and deployment of Mathematical Games
Pratt Dave, University of Warwick, United Kingdom

Mobile learning in informal science settings

Scanlon Eileen, The Open University, United Kingdom

Mobile Learning
Sharples Michael, University of Nottingham, United Kingdom

Mobile Support for Integrated Learning
Dillenbourg Pierre, Ecole Polytechnique Fédérale de Lausanne, Switzerland

Narrative and Learning Environments
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Participatory Design
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Personalised and Collaborative Trails of Digital and Non-Digital Learning Objects
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Philosophy of Technology Enhanced Learning
Derry Jan, Institute of Education, University of London, United Kingdom

Production of educational formats
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Semantic Web and E-Learning
Herin Daniele, Université Montpellier II, France

Shared Virtual Laboratory
Derycke Alain, Université des Sciences et Technologies de Lille, France
Peter Yvan, Université des Sciences et Technologies de Lille, France

Technology enhanced learning in mathematics
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Technology enhanced public spaces for intergenerational learning
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The impact of technology-enhanced learning on roles and practices in higher education
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Users' Group
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Dondi Claudio, Scienter Società Consortile a Responsabilità Limitata, Italy (also leader of *Gateway*)
Montandon Lydia, Atos Origin Spain, Spain (initiator of *Gateway*)

Virtual Doctoral School
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Seed grants

A centralized research data repository
Melis Erica, Saarland University, Germany

Designing for Technology Enhanced Learning in Museums
Bannon Liam, University of Limerick, Ireland

Efficent Context-Aware Collaborative Learning
Jarvela Sanna, University of Oulu, Finland

Integrated Digital Language Learning
Granger Sylviane, Université catholique de Louvain, Belgium

Kaleidoscope Resource Sharing
Hoppe Ulrich, University of Duisburg, Germany

Learning in the medical sector
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Methodology And Tools for Experimentation Scenario
    David Jean-Pierre, MeTAH/CLIPS, France
Self-regulated Learning in Technology Enhanced Learning Environments
    Steffens Karl, Universitaet zu Koeln, Germany: