FP7 Large-Scale Integrating Project

Project Overview

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Executive Summary

The agility of organizations has become the critical success factor for competitiveness in a world characterized by an accelerating rate of change. Agility requires that companies and their employees together and mutually dependently learn and develop their competencies efficiently in order to improve productivity of knowledge work. Failures of organisation-driven approaches to technology-enhanced learning and the success of community-driven approaches in the spirit of Web 2.0 have shown that for that agility we need to leverage the intrinsic motivation of employees to engage in collaborative learning activities, and combine it with a new form of organisational guidance. For that purpose, MATURE conceives individual learning processes to be interlinked (the output of a learning process is input to others) in a knowledge-maturing process in which knowledge changes in nature. This knowledge can take the form of classical content in varying degrees of maturity, but also involves tasks & processes or semantic structures. The goal of MATURE is to understand this maturing process better, based on empirical studies, and to build tools and services to reduce maturing barriers.

MATURE's outcome will be

(1) an **analysis of real-world maturing practices**, resulting in a sound general conceptual model of the knowledge maturing process and ways to overcome barriers to it (particularly including motivational and social)

(2) a **Personal Learning & Maturing Environment (PLME)**, embedded into the working environment, enabling and encouraging the individual to engage in maturing activities within communities and beyond

(3) an **Organisational Learning & Maturing Environment (OLME)**, enabling the organisation to analyze and to take up community activities, to reseed innovation processes and to apply guiding strategies

(4) reusable **Maturing Services for seeding and reseeding**, and creating awareness of maturing-relevant individual and community activities

MATURE brings together an experienced multi-disciplinary team of outstanding experts. To leverage their combined skills, it utilizes a participatory design methodology, involving companies inside and outside the consortium, including an associate partner network.

The MATURE Large-Scale Integrating Project has a budget of 9.5 Million Euro and is co-funded by the European Commission, Unit for Technology-Enhanced Learning & Cultural Heritage within Call 1 of the Seventh Framework Programme. The project is scheduled to start in April 2008 and has a duration of four years. MATURE is actively seeking partners from industry and academia who want to join the MATURE vision, contribute their experiences and to benefit from MATURE results at an early stage.

Motivation & Challenges: Why we started MATURE

Agility has become a critical success factor for organisations in today's economy. Agility requires that organisations are able to quickly adapt and improve their processes, products and services, which demands that

- their **individual** employees continuously learn about new methods and technologies in order to develop their competency to act

- the **organisation** continuously learns and innovates, by recognising, taking up and making effective use of its employees' creativity, enabled by their acquired competency to act

Traditional approaches to meeting these inter-dependent learning needs are woefully inadequate, especially when it comes to knowledge work and knowledge workers. They simply do not meet current demands for rapid competency-development and innovation, as illustrated by the following four major problems that they fail to adequately address.

- Learning is separated from work, leading to losses and inefficiencies caused by context changes between work and learning.
- Knowledge, e.g. a new subject or process, learned by one individual is not easily passed on to others, resulting in sub-optimal levels of organisational knowledge.
- Knowledge sources are disconnected, decreasing awareness of new ideas and hindering innovation. Connections to knowledge sources from partners and customers are especially important, since innovative ideas often come from the larger network within which the organisation operates.
- The process of transitioning emerging topics into mature knowledge that aligns with organisational goals is not well understood or supported. In particular, there is an urgent need for processes that simultaneously motivate employees to make contributions to knowledge, and guide those contributions towards organisational goals.

Failure to address these problems is costly to organisations. For example, organisations need to pass on knowledge (for example, about new base technologies) from their research and architecture groups to distributed development teams, to marketing, sales and customer support employees, and even to external solution partners (which in many cases are SMEs). Currently, the time needed to pass on this knowledge is often a major obstacle to the faster introduction of new products and services. In this regard, inefficient learning and innovation processes can cause a time lag that significantly delays time-to-market. This can cause the organisation to miss its window of opportunity, lose its market share and, ultimately, its profitability, if it is a for-profit company.

On the bright side, we observe the emergence of a multitude of low-cost and low-barrier Web 2.0 approaches, which show that there is a potential to motivate individuals to get intensively occupied in informal learning and unsolicited knowledge sharing activities. This has been reflected by some authors who suppose transferability to the domain of e-learning and have shaped the term **e-learning 2.0** in which passive consumption has been replaced by active creation, transformation, and communication of knowledge and reflection on processes and their outcome. Indeed we observe a fascinating engagement of individuals in communities, which is confirmed by results from CSCL research. We propose to carry forward this impetus to organisational contexts and in this way to overcome existing cumbersome procedures for human-resources development with agile and flexible

community-driven knowledge sharing and learning approaches that solve the major problems we have identified in existing solutions.

The proposed approach rolls up the four identified major problems into two major challenges:

- *How do we leverage the intrinsic motivation of knowledge workers to contribute to learning efforts?*

- *How do we foster effective contribution of individual learning activities to organisational goals and ensure sustainable impact of these activities?*

Mature proposes to address the first challenge by developing a solution in which learning activities of knowledge workers are conceived (and technically supported) as embedded into, interwoven with, and even indistinguishable from **everyday work processes** [Schmidt 2006]; creation, transformation, and communication of knowledge are characteristic for knowledge work. **Personal learning environments** [Wilson 2006; Attwell 2007] will be merged with personal working environments, dealing with the **variety of work-relevant knowledge assets beyond mere e-learning contents**. Moreover, instead of motivating knowledge workers by external incentives, we will leverage their **intrinsic motivation** by providing immediate benefits for their engagement in producing, sharing, and discussing knowledge assets. In this respect, we take into account central lessons learnt from the **grassroots Web 2.0 approaches**, namely, that services and systems will be used if they satisfy the individual's needs.

Mature proposes to address the second challenge by developing a solution in which individual learning activities and outcomes are not isolated, but rather are interlinked and easily shared. Novel, reliable knowledge with impact (e.g., in the form of wide-spread use in training, or as new/improved products, services, or processes) is not constructed by a single worker in one fell swoop, but rather evolves in collaboration with other members of a community. Therefore, the solution will foster collaboration in communities, and will provide varying degrees of **organisational guidance** to achieve timely and sustainable impact. Most importantly, it will support the identification of significant emerging topics and their transformation to more mature forms of knowledge. Using the proposed solution an organisation will be able to accelerate its innovation and speed up the acquisition of competency by individuals and communities. Thus, it will be able to achieve the agility required to compete in today's economy.

Knowledge Maturing: The concept behind it

Learning is an inherently social and collaborative activity, in which individual learning processes are interdependent and dynamically interlinked with each other: the output of one learning process is input to the next. If we have a look at this phenomenon from a macroscopic perspective, we can observe a "knowledge flow" across different interlinked individual learning processes. The knowledge becomes less contextualized, more explicitly linked, easier to communicate, in short: it matures. The **knowledge maturing process** theory structures this process into five phases (based on experiences from several practical cases, [Schmidt 2005, Schmidt & Maier 2007]):

- **Expressing ideas**. New ideas are developed by individuals from personal experiences or in highly informal discussions. The knowledge is subjective and deeply embedded in the context of the originator. The vocabulary used for communication or in private notes is vague and often restricted to the person expressing the idea.

- **Distributing in communities**. This phase accomplishes an important maturing step, i.e. the development of common terminology shared among community members, e.g., in discussion forum entries, blog postings or wikis.

- **Formalizing.** Artefacts created in the preceding two phases are inherently unstructured and still highly subjective and embedded in the context of the community. In this phase, purpose-driven structured documents are created, e.g. project reports or design documents or process models in which knowledge is desubjectified and the context is made explicit.

- **Ad-hoc learning**. Documents produced in the preceding phase are not well suited as learning materials because no didactical considerations were taken into account. Now the topic is refined to improve comprehensibility in order to ease its consumption or re-use. The material is ideally prepared in a pedagogically sound way, enabling broader dissemination, e.g. service instructions or manuals.

- **Formal training.** The ultimate maturity phase puts together individual learning objects to cover a broader subject area. As a consequence, this subject area becomes teachable to novices. Tests and certificates confirm that participants of formal training have achieved a certain degree of proficiency.

We further have to consider the different **levels of interaction** that accompany this process. Here we find a progression from the level of individuals to the level of communities, and, finally, to the level of organisation:

- The starting point is the knowledge worker as an **individual.** Coming up with new ideas and experiences, they often freely share these with others. If these experiences are to spread, a joint understanding is necessary, and is accomplished by communication within groups sharing the same interest and vision.

- Such **communities** are compelled to find a common footing for their joint action and the achievement of common goals. However, communities are characterised by common interests and aim at the exchange of experience and not at the realisation of common goals.

- This is the focus of the **organisations**, the third level of interaction. In the organisation knowledge workers join their forces to direct them towards agreed or given targets. This requires even more understanding, coherence, and agreement than the mere exchange of information in communities. Thus it is usual that

organisations actively propagate to their members the goals for which they strive and the ideas associated with those goals. It has to be remarked that maturing processes often go **beyond intraorganisational learning processes**; in particular on the individual level many of them are **interorganisational**, e.g., personal networks. Not only in SMEs, but also in big companies, communities often cross organisational boundaries and new influential ideas come from partners and customers.

To further refine the initial view of the maturing process, we also have to broaden our view to include the **knowledge assets** that are vital for the working and development of any kind of network or organisation. These assets are of three kinds:

- **Contents** such as documents, images, videos etc. certainly play a central role. However, they only provide a static picture of the world.

- We see a need to also include knowledge assets that are more tightly related to the actual work **process**, the dynamic aspect of the organisation. Large organisations already support this by developing business process models and workflows. For SMEs this approach is much too cumbersome, since the organisational learning processes are much more agile and the costs of modelling approaches are considerable. A more suitable approach for SMEs is a solution that enables recording and sharing of individual work practices.

- For inter-linkage of assets we have to take the **semantics** into account. Semantics connects the different assets and supports the individual learning process by providing the basis for mutual understanding. This is especially important if we focus on a grassroot approach that is to encourage people to contribute their individual views, experiences and insights. Without a semantic integration such an approach would get stuck in misinterpretations and lengthy negotiation processes.

Within MATURE we refer to the knowledge assets *contents*, *semantics*, and *processes* as the "**three stands**" of MATURE. These three stands are **closely interwoven** and they depend on each other in various respects. Contents and processes require semantics to become communicable. Therefore semantics is the fundament for every community-based approach and fosters collaboration between individual knowledge workers. Without process integration semantics and contents are not directly applicable to work procedures so that additional transformation efforts by the knowledge workers are required. Finally contents are required to explicate semantics and processes so that these are comprehensible to knowledge workers with different backgrounds. While semantics and processes focus on the actual doing contents aim at understanding and reflection. Summing up, a development of one of these stands alone will end up in incoherencies and thus decrease the efficiency of the organisation. A change in one of them always induces changes in the others. The three stands appear in different ways depending on the level of interaction.

Figure 1 depicts the described situation schematically. The bottom part shows that the **abundance** of knowledge assets decreases as maturity progresses: While there are many notes and even communication artefacts at the beginning of the process, formal training materials, like e-learning courses, are rather scarce at its end. The top part of Figure 1 shows that the maturing process covers all three levels of interaction, from individual to organisational, and is accompanied by a **process of guidance**. This process of guidance relates to the influence of the organisation on the behaviour of communities and individuals. In general, as maturity increases, so does guidance. This is reflected in the type of assets at the various phases of maturity. For example, a corporate process standard usually influences behaviour more strongly than a task pattern.
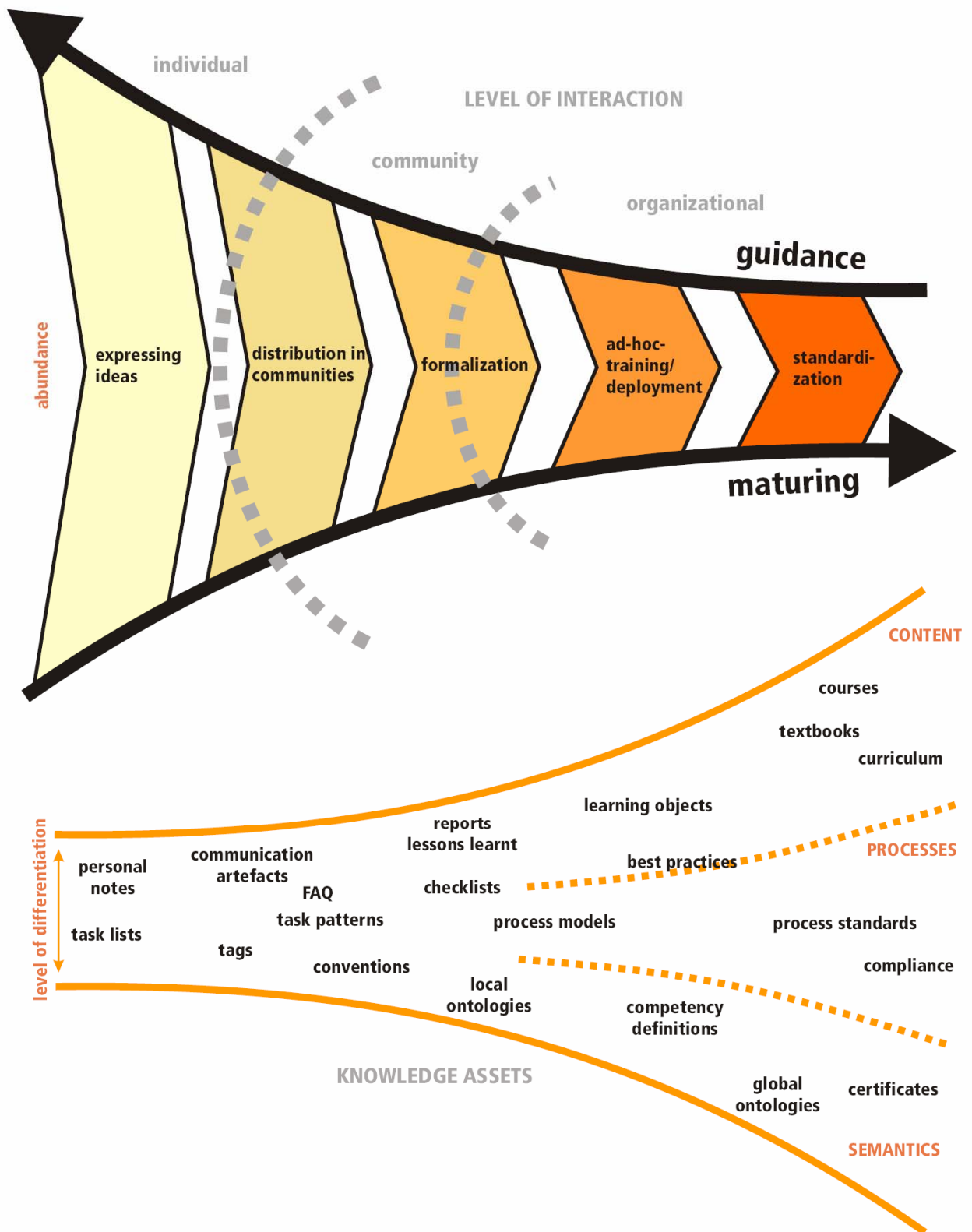
Figure 1: Knowledge Maturing Process Model

As the process of guidance already indicates the development should not be misunderstood as a continuous linear process. On the contrary, **maturing is made up of a complex pattern of individual steps**. Knowledge assets usually are not developed up to the

ultimate maturity phase, some of them are discarded; others are combined with other assets at various maturity levels, or split up into more differentiated assets.

In fact, the maturing process also contains radical restructuring processes. A closer look at how individual maturing phases actually take place reveals that the theory of **Seeding**, **Evolutionary Growth and Reseeding**, (SER) from [Fischer et al. 1996] describes these processes well. It basically states that innovation processes need to be seeded with an initial input. Afterwards, community activity leads to evolutionary growth of the new ideas. At some point in time, the process needs to be reseeded in a form of consolidation where the involved knowledge is pruned and consolidated. Thus the SER model bridges individual and organisational learning. Seeding initiates the maturing process which guides the evolutionary growth phase. At the end of each maturity process phase, a decision has to be taken. One alternative is to reseed the current maturity step which means cleansing of the current knowledge base (the collection of relevant knowledge assets), selecting a portion of the knowledge elements and re-starting the maturing process on the same maturity level. If a portion of the knowledge base is considered sufficiently mature, it is selected and used to seed a maturity process at a higher level of maturity.

On a technical level, if we consider the knowledge assets that appear in Figure 1 we find that they are supported by a variety of mainly independent tools divided both along the levels of interaction and along the type of knowledge asset (as exemplarily compiled in Table 1). The independence of these tools reflects the existing gaps in the maturing process as it exists so far.

Table 1. Separation of knowledge assets within different tools

Dimensions Levels of Interaction → Knowledge Assets ↓	Individual	Community	Organisation
Contents	contacts, notes, drafts ←→	wiki pages, blogs ←→	manufactured contents
Semantics	tags, conventions ←→	local ontologies ←→	global ontologies
Processes	tasks ←→	task patterns ←→	process models

To overcome the described separation, MATURE will connect tools in which assets are managed (such as those described in Table 1) and provide services that support the information flow between the different levels. This concerns the introduction of individual knowledge assets to communities as well as alignment of these in organisational terms. Generally speaking, MATURE aims at the integration of the three stands between the different levels of interaction and their mutual adjustment.

The MATURE Vision: What we want to do

The MATURE project aims at establishing the foundations for **making maturing processes** within and across organisations more efficient, thus **increasing the agility of organisations**. In order to realize that, MATURE will establish a **sound conceptual basis for understanding maturing activities**, their barriers and the possibilities to foster maturation. This will be done in an empirical study on current practices and motivational factors as well as a subsequent modelling activity absorbing relevant individual learning theories, results from cognitive psychology and organisational learning theories.

Furthermore, MATURE aims at building reusable **services** and **a framework for these services** that specifies a shared infrastructure, as well as the interactions and dependencies between these services. To make these services usable by members of an organisation, MATURE will develop **environments** for the individual knowledge worker (a **Personal Learning and Maturing Environment** fostering bottom-up maturing) and for the organisational perspective (an **Organisational Maturing Environment** that enables the guidance of maturing processes). Both are essentially a set of loosely coupled tools embedded into the work environment. These services and environments are aimed at the following problem areas, categorised by the different types of knowledge assets: contents, semantics and processes:

Contents

- ▪ *Incomprehensible contents.* Individual content has often been created for personal usage and consequently is difficult for others to understand. By additional measures such as further refinement or better semantic representation the value of such contents for others could be decisively increased. The MATURE framework will support this refinement within work-integrated **Personal Learning & Maturing Environments**.

- ▪ *Hidden relevant contents.* Contents are continuously created and updated. Knowledge assets that are relevant for others should be made visible to the respective target group. However, for the content creator often it is not clear which assets are relevant to whom. The MATURE framework will provide **awareness services** that detect such contents, make them visible for others, and incorporate **technology for collaborative refinement**.

Semantics

- ▪ *Missing semantic standard.* Individual knowledge workers see the world in various ways. This is represented in various semantic structures that partially contradict each other. However, this mismatch hinders communication and comprehension. The MATURE framework will provide **services to detect semantic similarities** of personal structures and **to support mutual alignment**.

- ▪ *Ambiguity of formal structures.* Formal semantic structures can help knowledge workers to find a faster way through the available contents. However, learning to use these formal structures requires interpretation that must be consistent throughout the organisation. Often this is not the case and a collective coordination process is required. The MATURE project will help knowledge workers to agree on semantic structures by providing **negotiation spaces** embedded into their personal work environments.

Processes

- *Missing work pattern capturing.* The activities of the knowledge workers are the actual heartbeat of an organisation or a network. Therefore the experience of knowledge workers should be made available to others. The MATURE project will provide a personal learning environment including **recording of work activities**, **easy and encouraging sharing facilities**, and **tools to compile them in abstract form** to make them accessible for others.

- *Rigidity of organisations.* Organisations have a natural tendency to establish permanent structures. This is necessary to achieve efficiency but it must not hinder the development of the organisation. To guard against organisational rigidity, MATURE framework will provide **awareness and analysis services** to managers, process owners, ontology engineers and other guiding members of the organisation (bundled in **Organisational Maturing Environments**). These services can be used to apply **breeding strategies**, i.e., to start the necessary organisational learning processes as soon as possible and to allocate additional resources to them.

As a summary, the main objectives of the MATURE project consist of

- an **analysis of real-world maturing practices**, and a general **conceptual model of the knowledge maturing process** and specializations for the different types of knowledge assets (content, process, semantics), its current state-of-practice, how it should take place and how to overcome barriers (particularly including motivational and social)

- a **Personal Learning & Maturing Environment (PLME)**, embedded into the working environment, enabling and encouraging the individual to engage in maturing activities (comprising content, process and semantic aspects) within communities and beyond

- an **Organisational Learning & Maturing Environment (OLME)**, enabling to analyze and to take up community activities (comprising content, process, and semantic aspects), to reseed innovation processes and to apply guiding strategies

- reusable **Maturing Services**, creating awareness of maturing-relevant individual and community activities, helping in combination and consensus building (comprising content, process, and semantic aspects)

These objectives and expected outcomes translate into the MATURE system vision as displayed in Fig. 2. PLMEs are integrated into the working environments of the individual knowledge worker, consisting of loosely coupled tools, to engage in collaborative maturing activities. OLMEs allow organisational representatives such as personnel development coaches, knowledge managers or subject matter experts for analyzing community activities based on Maturing Services. These services and environments are connected via a Knowledge Bus infrastructure with enterprise systems that contain relevant artefacts, i.e. contents and knowledge items.
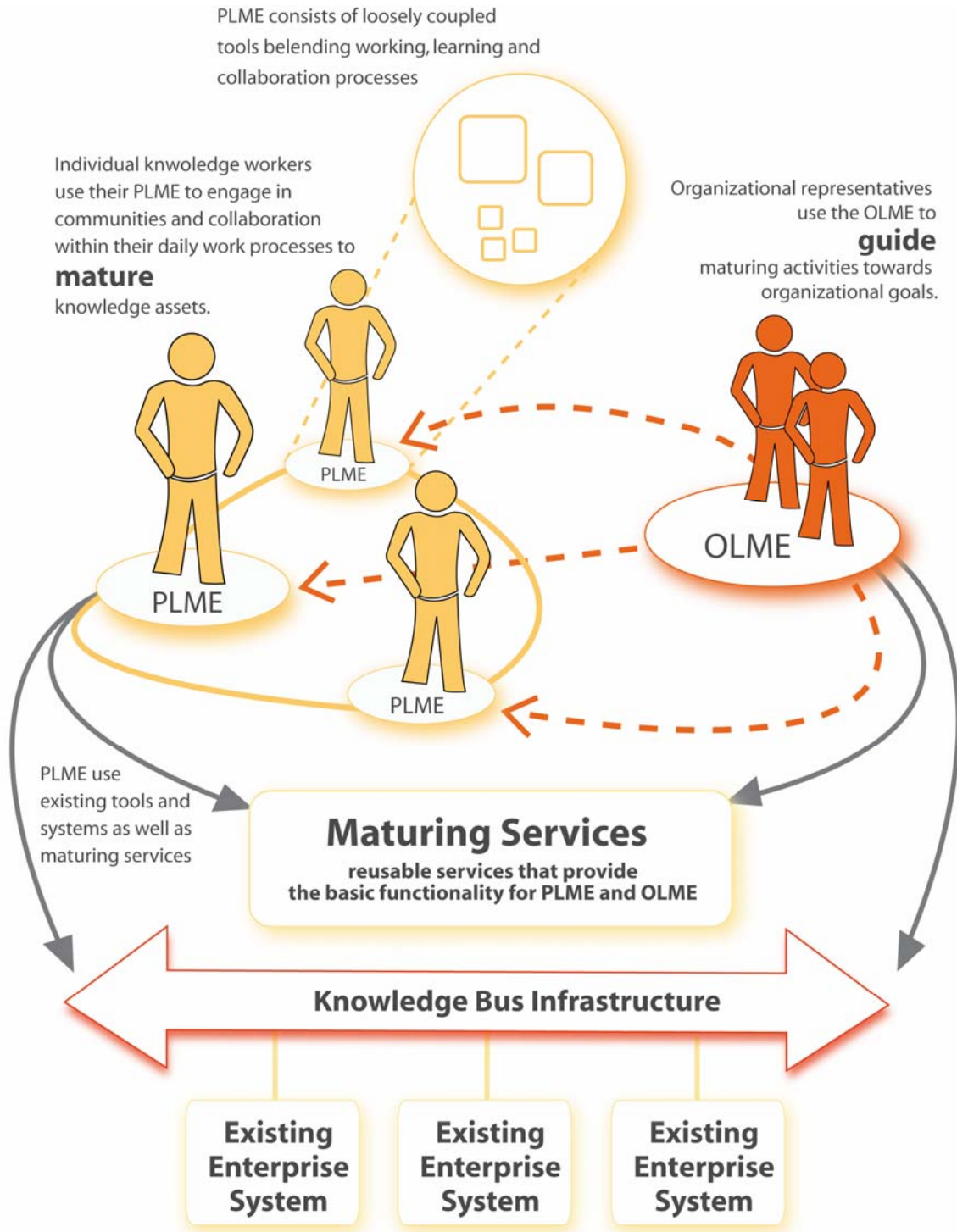

Figure 2: MATURE system vision

Work Plan: How we are going to work

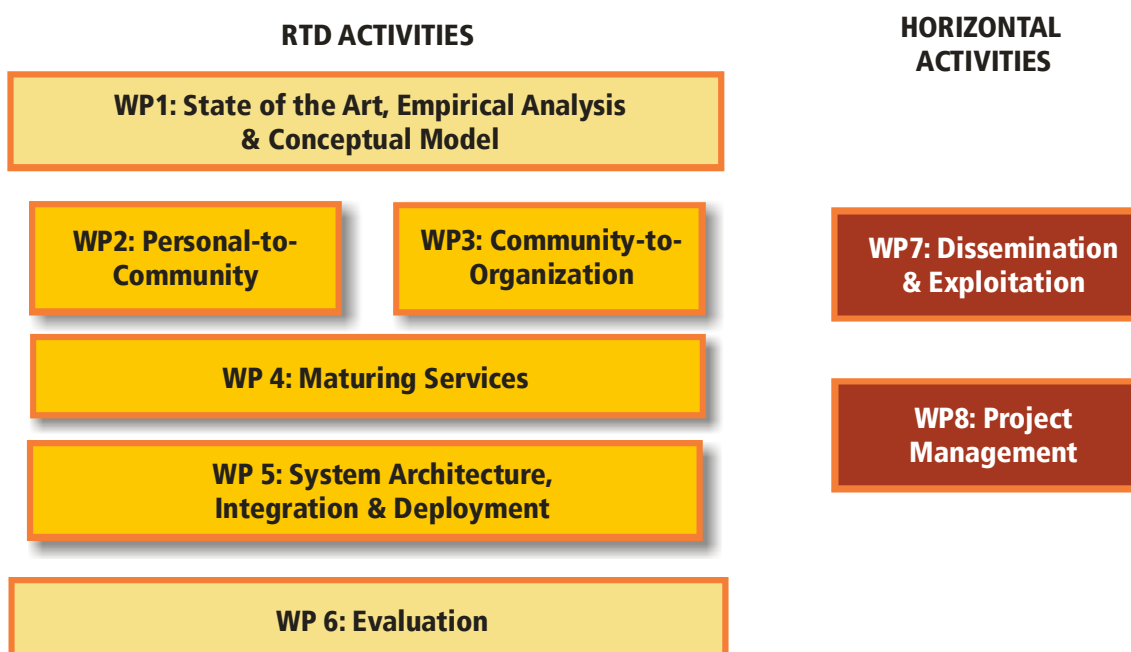MATURE is structured into 6 Workpackages with RTD activies and 2 horizontal workpackages as described in Fig. 3.

RTD ACTIVITIES   **HORIZONTAL ACTIVITIES**

WP1: State of the Art, Empirical Analysis & Conceptual Model

WP2: Personal-to-Community   **WP3: Community-to-Organization**   **WP7: Dissemination & Exploitation**

WP 4: Maturing Services   **WP8: Project Management**

WP 5: System Architecture, Integration & Deployment

WP 6: Evaluation

Figure 3: Overall MATURE project structure

- **WP1** builds a common ground for the project concerning the state of the art about concepts and theories required to understand the knowledge maturing process as well as about the state of practice on knowledge maturing from a human-oriented, an organisational and an ICT perspective.
- **WP2** designs a personal learning and maturing environment (PLME) based on the model developed in WP1 and in coordination with WP3. To this end it makes use of the services developed in WP4.
- **WP3** realises a design and an implementation of the organisational learning and maturing environment (OLME) which allows organisational experts to identify relevant knowledge assets arising from communal interaction. Its work is based on the model developed in WP1 and in coordination with WP2 und WP4 making use of the services developed in these work packages.
- **WP4** designs and implements a variety of Maturing Services which are used by WP2 and WP3 to support the transitions between personal, community, and organisational learning. These encompass services accessing relevant knowledge sources and analyzing their content and relationships from various perspectives (e.g. usage, process, topic, content).
- **WP5** provides a service-oriented infrastructure forming the basis for the interaction between WP2-4 and with existing sources and deploys the integrated prototypes at the application partners' sites.
- **WP6** specifies the expected outcome of the MATURE developments in a verifiable form and will conduct formative and summative evaluations at application partners' sites.

MATURE

The project can be delineated into four streams which run in parallel throughout the research and development phases (see Figure 7). The three streams are *Empirical Studies & Conceptual Model*, *Methods & Algorithms, Software Development*, and *Application & Evaluation*. At the end of each year, a synchronisation stage will ensure that consolidation happens and leads to convergent results. Cross-fertilization in this stage is ensured by a number of project internal workshops and trainings.
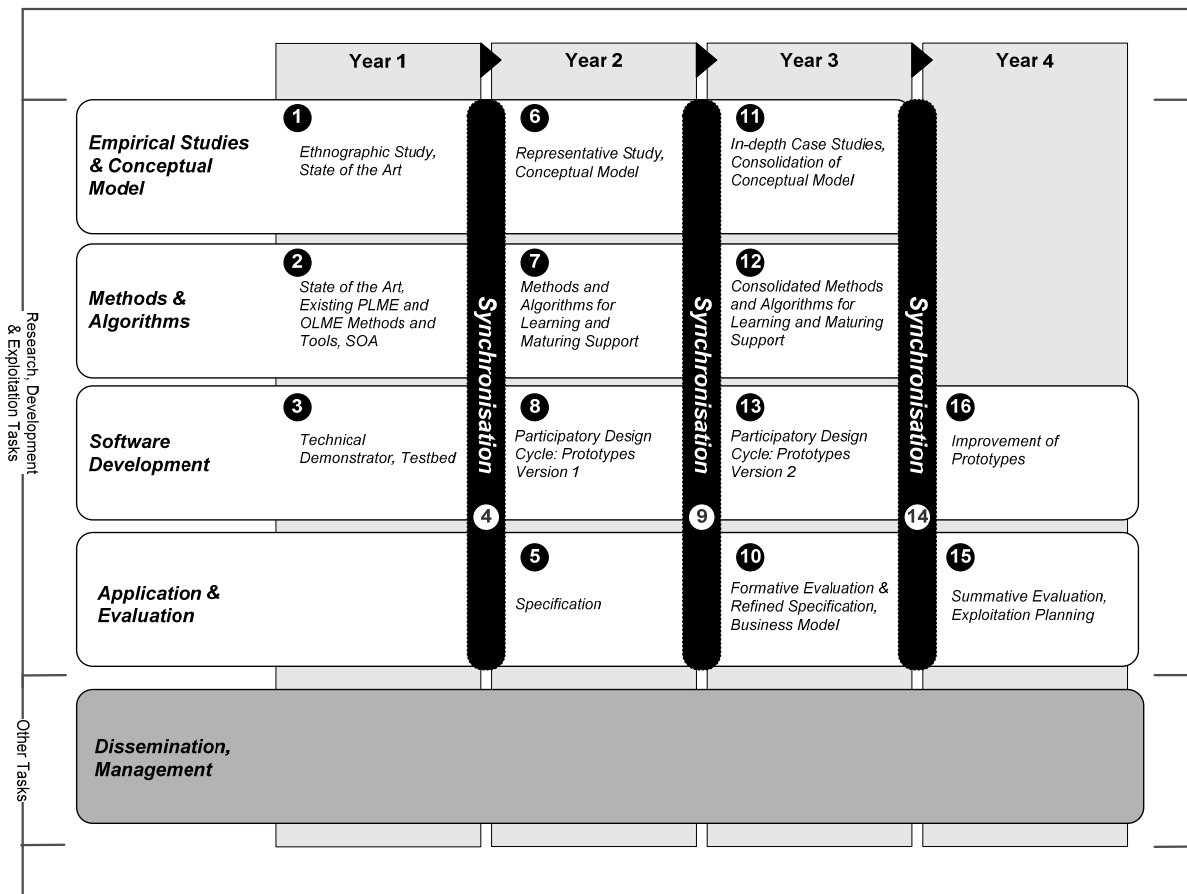

Figure 4: Parallel streams of the project

Participation: How you can participate

In order to align our research closely to the real maturing needs of organisations, MATURE applies a user-centered design (specifically the Scandinavian participatory design approach) to our MATURE process development and the creation of our service prototypes. In participatory design end-users (putative, potential or future) are invited to cooperate with researchers and developers during an innovation process. Potentially, they participate during several stages of an innovation process: they participate during the initial exploration and problem definition both to help define the problem and to focus on ideas for solution during prototype development. Later they help to evaluate the proposed solutions. MATURE has decided to include the following user groups:

- **Small core group: 3 application partners**
  Three application partners within the consortium will serve as first test beds for our ideas and prototypes. Empirical investigations will start with in-depth ethnographic studies within these organisations in order to identify not only organisational and technological, but also motivational, cultural and social factors involved.
  - The first use case from Swisscom aims at improving the internal product and service innovation process, enabling faster take-up of bottom-up ideas through the use of MATURE technologies. This does not only apply to content (product and service innovation), but even more to processes (process innovation).
  - The second use case from Structuralia aims at improving the faster take-up of customer demands for timely production of appropriate learning content. This involves both the maturing of content and of semantic structures for organising the huge amount of learning material.
  - The third use case from the University of Warwick career guidance network, a network of career guidance counsellors coordinated by the University of Warwick, demonstrates how interlinked Personal Learning Environments help independent experts to develop their competencies collaboratively.

- **Large empirical group: stratified sample of 200 companies**
  In order to verify our findings within the core group, we will conduct telephone interviews with at least 200 companies. The sample will be stratified according to the two criteria size and knowledge intensity of the business sector. These surveys will be used to cluster companies according to knowledge types, routines and structures used in stages of maturity, identified needs and challenges.

- **Small diverse subset: 5-10 companies selected from the large empirical group**
  After having identified different MATURE company types, we will select one company of each type in order to conduct in-depth investigations of their maturing processes, knowledge sources, applied systems and methodologies.

- **Long term group: associate partners**
  We have further established a network of associate partners. These will be continuously informed about research results and will be invited to periodically test prototype solutions developed in MATURE and to give feedback contributing to design and development processes. From a long term perspective, it is our intent to attain additional application and exploitation partners from this subset of closely associated companies.

Companies and non-profit organisations from all areas as well as research institutes are invited to join the **Associate Partner Network** and contribute their experiences:

> **Reasons to join the Associate Partner Network of MATURE**
>
> - Privileged and early access to research results as well as developed technologies
> - Opportunity to co-shape the outcome of MATURE
> - Unique opportunities of networking with leading companies and research institutions on an European level in the fields of technology-enhanced learning, knowledge management, human resources, business process management, among others

Associate Partners will be invited to take part in the empirical studies, to participate in partner workshops, and will have unique opportunities to benefit from developed solutions.

As of September 2007, the MATURE associate partner network already consists of the following organizations:

sitewaerts GmbH, Germany
Dynamic Media, Austria
EXODUS S.A., Greece
Ostermann Syskomm GmbH, Germany
Know-Center, Austria
GISA GmbH, Germany
magh&boppert, Germany
HELIOS Akademie (HELIOS Kliniken), Germany
EDEN, Hungary
Zentrum für soziale Innovation (ZSI), Austria
University of Salford, UK
University of the Basque Country, Spain
UHI Millenium Institute, UK
University of Klagenfurt, Austria

If you are interested or have further questions on partnership, please contact the Scientific Coordinator Andreas Schmidt (andreas.schmidt@fzi.de) or any of the partners in the consortium you are in contact with.

The Consortium: Who we are

CIMNE - International Centre for Numerical Methods in Engineering

The International Centre for Numerical Methods in Engineering (CIMNE) is a research organisation in Barcelona, Spain. CIMNE was created in 1987 as a Consortium between the Catalan regional government and the Universitat Politècnica de Catalunya, with the support of UNESCO. CIMNE employs some 150 scientists and engineers from different technical fields and nationalities (over 15 different countries) in the development and application of numerical methods to a wide class of engineering problems aimed to achieve positive economical and social impact with innovative technologies.
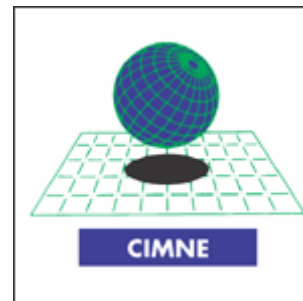
CIMNE is the **administrative coordinator** of the project and further contributes its experience in implementing user-friendly interfaces to complex analysis services to the **development of the Personal Learning & Maturing Environment**.

Key People: Pablo Franzolini, Gilbert Peffer

FZI – Research Center for Information Technologies at the University of Karlsruhe

FZI is a technology transfer center which is closely linked to the University of Karlsruhe, which is one of three universities of excellence in Germany. FZI covers a broad range of information technology topics. For the MATURE project, the Information Process Engineering (IPE) research division will be involved, which is renowned for its research in the area of ontologies and Semantic Web technologies, holistic informal learning support including personal knowledge management, as well as market and incentive engineering topics. The IPE division within FZI has a strong record of transferring research results into industrial practice, both through its three Spin-Off companies and by contract research with industrial partners like DaimlerChrysler, SAP and numerous SME companies. FZI additionally is the focal point of a network of more than 100 IT companies within the high-tech region of Karlsruhe.

FZI is responsible for the overall **technical and scientific coordination** of the project, the development of a sound **conceptual model of knowledge maturing** and the investigation of **motivational aspects**. FZI also leads the **dissemination and exploitation** activities and especially be responsible for developing a sound **business model** based on state-of-the-art service science. FZI furthermore contributes its experience to design and development of the Personal Learning & Maturing Environment with the aspects of **collaborative knowledge structuring and ontology engineering** as well as the realization of **social awareness**.

Key People: Andreas Schmidt, Peter C. Lockemann, Rudi Studer, Christof Weinhardt

TUG – Graz University of Technology

The Knowledge Management Institute at the Graz University of Technology (TUG) undertakes interdisciplinary research on knowledge management in a broad spectrum of domains, integrating technological and application-oriented perspectives. Leveraging its expertise, TUG aims to make a substantial contribution to teaching within the "Software Development and Economy" Study Program of Graz University of Technology. The technology-oriented research stream focuses on acquiring, managing and applying semantic metadata, relying on technologies such as MPEG-7, RDF and OWL. From an applied perspective, TUG investigates the use of social software in the context of Web 2.0 to build structure and transfer knowledge within and across organisations. A special focus in this area is on contextualizing learning events in the professional workplace.

> TUG coordinates the work on realizing **reusable maturing services** and builds **mining and analysis services** based on its KnowMiner infrastructure.

Key People: Stefanie Lindstaedt, Klaus Tochtermann

SAP AG

SAP has been involved for thirty years in the business of helping businesses grow through innovation. Founded in 1972, SAP is the recognized leader in providing collaborative business solutions for all types of industries and for every major market. Headquartered in Walldorf, Germany, SAP is the world's largest inter-enterprise software company, and the world's third-largest independent software supplier overall. SAP employs over 28,900 people in more than 50 countries. Its professionals are dedicated to providing high-level customer support and services. With a unique partner ecosystem, SAP has more than 1,500 partners and overall more than 120,000 certified SAP partners. Through SAP Global Research and Innovation comprising Corporate Research and SAP Inspire, SAP introduces new technologies for future solutions. Strategic research areas addressed by SAP Research organised in Research Programs such as: Business Process Management and Semantic Interoperability, Knowledge People Interaction, Software Engineering and Architecture, Security and Trust, and Smart Items.

> SAP brings in its **business experience** in the areas of **business processes** and **human resource management** and its current research activities in the area of **task management**. SAP is mainly involved in the **Organisational Learning & Maturing Environment**, but also contributes to the **process/task aspects** within the PLME. Furthermore, SAP demonstrates the **prototypical integration into their current products** as part of their exploitation activities.

Key People: Uwe Riss, Torsten Leidig

FHNW – University of Applied Sciences Northwestern Switzerland

FHNW (Fachhochschule Nordwestschweiz) was established as a merger of three universities (FHSO; FHBB; FHA) on 1 January 2006. FHNW is engaged in four product areas: (1) degree courses, (2) further education, (3) services and consultancy and (4) applied research and development. FHNW is composed of 9 schools each having several institutes. The transfer of new technologies and ideas into practical use affording advantages for companies, organisations, society and people is a main objective of FHNW. In the MATURE project, the Institute for Information Systems IWI, which is part of FHNW's School of Business, will be involved. IWI has a specific focus on business process oriented knowledge management and e-learning. It has a strong partner network mainly consisting of Swiss SMEs and public administrations and is involved in national and international research activities. Among others, there has already been collaboration with University of Paderborn, Swisscom Mobile, Swiss Federal Railways and other industrial partners for about 3 years in the MoKEx project, integrating knowledge management and e-learning into everyday work situations. FHNW has also been involved in the IST projects OntoGov (Ontology-enabled e-Gov service configuration) and FIT (Fostering self-adaptive e-Government Service Improvement using Semantic Technologies).

> In the MATURE project the **integration of individual and organisational learning into the daily work** and the business processes of an enterprise is the main contribution of FHNW. Due to geographical proximity FHNW specifically takes care for the **implementation** of the project results in a real application environment of **Swisscom Mobile**. FHNW further brings in its KnowledgeBus architecture.

Key People: Knut Hinkelmann

LTRI – London Metropolitan University, Learning Technology Research Institute

The Learning Technology Research Institute (LTRI) conducts research into the application of information and communication technologies (ICT) to augment, support and transform learning. Major research themes are: Learning objects and learning design, Learning interaction and networked communities and Informal e-learning. The research on learning objects and learning design concerns the design, development and use of reusable resources and designs. A two-year project has evaluated the use of learning objects with over one thousand students. Learning interaction and networked communities concerns the nature of effective learning dialogue and interaction with an emphasis on the development of supportive software tools. Informal e-learning studies the processes and impact of e-learning in informal settings. It extends the communities studied by the Institute beyond the domains of university, college and school. These research themes are supported by a rich and varied set of research projects. We also conduct evaluation of the implementation of learning technology.

> LTRI is responsible for conducting the **formative and summative evaluation** of MATURE design and prototypes.

Key People: John Cook, Claire Bradley

UPB – University of Paderborn

The University of Paderborn is represented by the Working Group 'Didactics of Informatics' which is part of the Institute of Computer Science within the Faculty of Electrical Engineering, Computer Science and Mathematics. The group is currently involved in the international MoKEx project for mobile learning and has experience in the integration of e-learning in knowledge management. It has further expertise in the following areas: Empirical analysis of learning processes, media-supported learning processes in ICT embedded learning environments, multi-media supported software development and system modelling especially in the area of learning environments.

> UPB brings in its pedagogical experience and knowledge into the design of the **Personal Learning Environment** and coordinate its development.

Key People: Johannes Magenheim

UIBK – University of Innsbruck

The University of Innsbruck is represented by the Information Systems Unit which is part of the Department of Information Systems, Production and Logistics within the School of Management. Topics of research studied at the Unit can be organised into the general theme of information management or, in a more recent term, information systems leadership. This research field investigates strategic activities in organisations which aim at applying leading and innovative ICT in order to achieve competitive advantages. Specific research interests include data, process and knowledge management.

> UIBK coordinates the **empirical work** within MATURE producing sound **representative insights into current maturing practices** and their problems and contributes to the refinement of the knowledge maturing model based on the experiences in **organisational learning**.

Key People: Ronald Maier, Stefan Thalmann

BOC – Information Technology Consulting

BOC is a software development house and a strategic consultant in business process re-engineering and knowledge management projects. It was founded in 1995 as a spin-off from the Department of Knowledge Engineering at the University of Vienna. The core compentency of BOC is the know-how on "Meta-Modelling". As the toolkit ADONIS was one of the first commercial Meta2Modelling toolkits, BOC gained technological leadership in this market.

> BOC will coordinates the **system architecture, integration and deployment** of the MATURE system. BOC will contributes to the OLME their experience in business process modelling.

Key People: Robert Woitsch

PONT – Pontydysgu ("The Bridge to Learning")

Pontydysgu is an independent research and development organisation based in Wales, UK. Established in 1999. the organisations' main research areas are Technology Enhanced Learning and the use of ICT for knowledge development and sharing. This includes research and development into new pedagogies for Technology enhanced learning, the recognition of informal learning, the training of teachers and trainers and the development of open source software for education and Open Educational Resources. More recently Pontydysgu has been researching and developing new applications and approaches to e-Portfolios and Personal Learning Environments and the use of social software for learning and knowledge development.

> As a leading company in that area, PONT leads the **design of the Personal Learning & Maturing Environment** and guide the implementation of it.

Key People: Graham Attwell

UWAR - University of Warwick

The Institute for Employment Research at the University of Warwick is one of Europe's leading centres for research in the labour market field. Its work focuses upon the operation of labour markets and socio-economic processes related to employment and unemployment in the UK at national, regional and local levels. It includes comparative European research on education, training and employment, with a particular focus upon career development.

The **vocational training network** will consist of careers guidance practitioners. The work with careers guidance practitioners has been established for the past ten years and includes face-to-face training support and the development of a website for the guidance community in order to support the development of effective guidance and the take-up and usage of labour market information. The National Guidance Research Forum website (http://www.guidance-research.org) provides a shared web-based knowledge base for the guidance community that seeks to bring guidance research and practice closer together.

> UWAR brings its **experience in the areas of vocational training** and takes the role of a application partner by **representing a network of career guidance experts**. This network provides the opportunity of observing knowledge maturing practices in a distributed setting and in close connection to individual competence development and offer opportunities for formative and summative evaluation.

Key People: Alan Brown

SW - SwissCom

Swisscom is Switzerland's leading telecoms provider, with over 4.8 million mobile customers, around 3.7 million fixed lines and more than 1.5 million broadband connections. Swisscom has a presence throughout Switzerland and offers a full range of products and services for mobile, landline and IP-based voice and data communication.

The company operates in a competitive market with a fast-changing product portfolio and decentralized organisational structures in various locations (HQ in Bern, Sales HQ in Bern and Zürich, virtual call center in 10 cities). SW has its own Sales Field Force for Small and Medium Enterprises/Large Accounts and supplies the following competitive distribution channels: almost 1'000 sales outlets (90 owned by Swisscom Holding), specialised dealers, shop-in-shop partners, IT Shop-Partners and mass market/chain channels.

> **Swisscom** takes the role of an application partner and provides a case study on the use of MATURE technologies in the product and service innovation processes.

STRUC - Structuralia

Soluciones Integrales de Formación y Gestión Structuralia, S.A. (Structuralia) was created in 2001, with the object and mission of becoming a reference for professionals, corporations and institutions development in Architecture, Engineering and Construction sector, by means of value increasing in work environments through new technologies, continuous learning and processes mechanization tools. Structuralia has a multi-specialized working team, composed by Construction, Teaching and ICT experts. It also holds up corporate agreements with Professional and Business Associations and Training Centres, focusing on quality, contents specialization, pedagogic models and latest technologies.

> STRUCT takes the role of a **technology and application partner**. It enhances its technology with MATURE components and participates in the evaluation, potentially together with a customer.

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