



LEONARDO DA VINCI - TRANSFER OF INNOVATION

INFORMATION AND KNOWLEDGE MANAGEMENT



This project has been funded with support from the European Commission. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Document data

Author:	Zsolt Tóth (ed.) – Darragh Coakley
Version:	final
Theme:	Knowledge management
WP:	WP4
Date:	5 th November 2012
Document Type:	product
File:	R10_sme2_module_km_EN_rev_f.doc
Lector:	Zsuzsanna Bódi
Product ID:	R10
Target group:	Employees, managers of SMEs

1	Introduction to knowledge management	4
1.1	Types of knowledge.....	4
1.2	Definition of knowledge management	4
2	Knowledge management within a web-enabled Living Lab.....	5
2.1	Essential elements of good knowledge management.....	5
2.1.1	Knowledge objects.....	5
2.1.2	The intranet, Internet and Living Labs	7
2.2	Living Labs, thinking processes and knowledge management labs	7
2.2.1	Thinking processes as parts of a Living Labs environment.....	8
2.2.2	The social media and knowledge management	8
2.2.3	Grounded theory	10
2.3	Knowledge interchange and management processes.....	10
2.4	Knowledge management, collaboration and the Internet	12
2.4.1	Collaboration software on the Internet	13
2.5	The Living Lab Knowledge Management framework	14
3	Knowledge management in virtual communities.....	15
3.1	Background	15
3.2	Classification of cultural areas.....	16
3.3	Role of software as a supporting tool for Internet communities	17
3.3.1	Aspects of possible support	17
3.3.2	Support for communication	18
3.3.3	Support for collaborative knowledge management and organizational challenges.....	19
3.4	Future platform for virtual communities	19
4	Collaborative learning.....	20
4.1	VLE, CMS, LMS	21
4.2	Development and characteristics of Moodle	23

4.2.1	Pedagogical antecedents.....	23
4.2.2	Features of Moodle in short	24
4.3	Networks, communication overload and knowledge map	25
4.4	“Creative projects”	27
4.4.1	Glossary development	27
4.4.2	Analysis of Internet forums	28
4.4.3	E-portfolio	28
4.4.4	Learning diary (blog).....	28
4.4.5	Essay on personal experiences	28
4.5	Digital storytelling	28
5	Acknowledgements	29
6	Other references.....	30

INFORMATION AND KNOWLEDGE MANAGEMENT

1 Introduction to knowledge management

Understanding knowledge is one of the most difficult endeavours of mankind. This module is not going to challenge Plato, Socrates, Russell, Hume, Polányi, and other brilliant writers on this topic. Rather it will briefly introduce fundamental ideas about knowledge and dig into the aspects of knowledge relevant to an SME more than the philosophical, social, and historical ones.

The value of knowledge is a key question given that the amount of information and knowledge is increasing exponentially.

This information overload, globalization, rapid change (making knowledge obsolete faster), the need to constantly learn and innovate, and the need to share best practices have been significant factors behind the growing importance of knowledge management within organizations in recent years. It has received the attention of managers at all hierarchical levels, not only knowledge management experts.

1.1 Types of knowledge

As there is no universally accepted definition of knowledge, there are numerous classifications of the knowledge types.

Most of them are irrelevant for an average SME. But the division of tacit and explicit knowledge perhaps can be interesting.

Polányi states that learning is a personal process, where previous knowledge influences how new knowledge can be gained. Therefore all knowledge has a tacit component and explicit (codified) knowledge that can be expressed and easily transmitted.

Transmission cost of codified knowledge is an interesting topic. On one hand, since it can be well articulated and stored, the marginal costs of transmission may be low. On the other hand, understanding codified knowledge may require prior (codified and tacit) knowledge and in its absence the transmission costs can rise significantly. Distance in terms of time, space, culture, and social environment are factors which can complicate the transmission.

1.2 Definition of knowledge management

Knowledge management means organizations' attempts to acquire, coordinate, diffuse, create, and utilize knowledge. When something is to be managed many people feel that in order to do this, it must be quantified, counted, organized and measured; it must be possible to be build, own, and control it if its value is to be maximized. For this reason, critics argue that knowledge in itself cannot be managed and that KM is just another management fad. Despite this extremist view, thousands of researchers are successfully active in the field of knowledge management, and as a result, there are numerous approaches to knowledge management.

Knowledge management processes, the role of knowledge in an organization have been studied in detail from many points of view: core competencies, organizational learning, dynamic capabilities, managerial cognition, organizational memory, distributed cognition, intellectual capital, and communities of practice.

Knowledge management strategies and instruments for companies include (Wikipedia, 2012):

- rewards (as a means of motivating for knowledge sharing),
- storytelling (as a means of transferring tacit knowledge),
- cross-project learning,
- after action reviews,
- knowledge mapping (a map of knowledge repositories within a company accessible by all),
- communities of practice,
- expert directories (to enable knowledge seeker to reach to the experts),
- best practice transfer,
- knowledge fairs,

- competence management (systematic evaluation and planning of competences of individual organization members),
- proximity & architecture (the physical situation of employees can be either conducive or obstructive to knowledge sharing),
- master-apprentice relationship,
- collaborative technologies (groupware, etc.),
- knowledge repositories (databases, bookmarking engines, etc.),
- measuring and reporting intellectual capital (a way of making explicit knowledge for companies),
- knowledge brokers (some organizational members take on responsibility for a specific "field" and act as first reference on whom to talk about a specific subject),
- social software (wikis, social bookmarking, blogs, etc.),
- inter-project knowledge transfer.

What can you do with this ramifying discipline in a course for SMEs? There is only one solution: you need choose the most relevant topics, and concentrate only on them.

On the basis of this starting point we'd like to focus mainly on three topics:

- Knowledge management in a new, web-enabled environment which integrates several new technologies (Living Lab)
- Knowledge management in virtual communities
- Collaborative learning

The topics mentioned above are connected with each other and lots of other areas of knowledge management, but they are can be seen as focal points of the discipline in SME's point of view.

2 Knowledge management within a web-enabled Living Lab

One of the main objectives of a Living Lab is to use knowledge for further innovation. Knowledge by itself is useless unless one applies it in context. The general objective of a Living Lab is to be a real life collaborative development platform.

2.1 Essential elements of good knowledge management

2.1.1 Knowledge objects

Knowledge objects (KOs) are any artefacts that knowledge seekers could use to learn, or expand their current knowledge, about a topic. Knowledge objects can be defined as sets of appropriate components of knowledge that users require for particular needs. The components of knowledge objects include various entities and properties of the entities as well as the various activities that one could associate with the processes of the entities to describe the knowledge they represent.

KOs can have a variety of formats, ranging from digital media to WEB 2.0 mashed objects. A Knowledge Object Repository (KOR) stores and manages used KOs. A KOR is a semantic web cataloguing and tagging system.

The current web dominated by unstructured and semi-structured documents. Some researchers believe that introducing semantic tagging to applicable documents will help to overcome this problem. Tagging ontologies and techniques tag KO objects semantically. They store and manage the subsequent metadata as part of the semantic knowledge bases and KORs.

Organisations, by themselves, cannot use corporate KM fully without using the correct tools (see above) to contribute, collaborate and integrate. The Internet provides social media tools for optimal knowledge management functionality.

Organisations should manage their knowledge assets so that they can achieve their objectives. This is the first and most important rule when organisations treat knowledge as assets.

“Organizational memory aims to deliver the right knowledge to the right person at the right time in the right format to enable the right action” (Dieng 2002:14–17). To apply this concept, organisations must use the correct tools. The Internet provides all the necessary tools and using it makes such an operational platform possible. The Internet allows organisations to integrate knowledge and creates working systems within the cloud. Nabil (2010) defines cloud computing as ‘clusters of distributed computers (largely vast data centres and server farms) which provide on-demand resources and services over a networked medium (usually the internet)’.

Doyle (2012) defines social media by stating that: Social media includes the various online technology tools that enable people to communicate easily via the internet to share information and resources. Social media can include text, audio, video, images, podcasts, and other multimedia communications.

Social networks are social media sites through which people connect to businesses or people with similar interests.

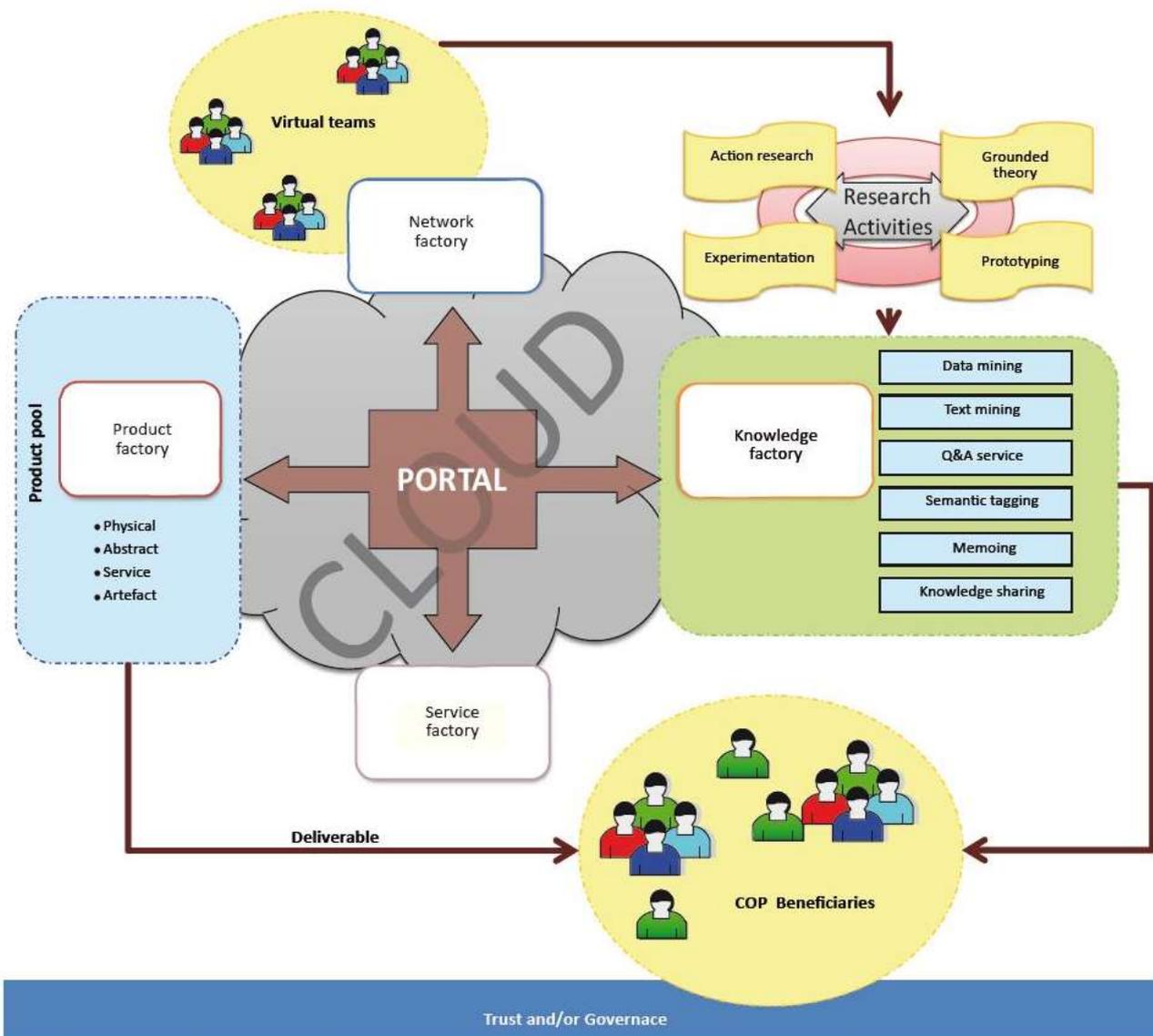


Figure 1: Web-enabled Living Lab Framework

2.1.2 The intranet, Internet and Living Labs

An intranet can use internal corporate memory whereas external memory relies on extranets that connect companies and their selected partners. These partners can include customers, suppliers and subcontractors.

A number of employees in organisations use the Internet to create and reuse corporate memories. Organisations can create corporate memories, allow them to evolve and then distribute or centralise them. Distributed corporate memories support cooperation and knowledge sharing between numerous people in organisations even if they are geographically dispersed.

Over 50% of the world's population was under the age of 30 in 2009. Therefore, social media is increasing because of the growth and addition of younger generations of users. In the United States of America (USA), 75% of the current generation uses social media.

The social media allow Living Labs to work. Therefore, integration, collaboration and full participation can occur. Living Labs for knowledge management allow end users to share and bank knowledge. Living Labs allow end users to see the bigger picture and provide insight into strategic and behavioural knowledge management efforts. The knowledge management drivers slot in perfectly with social media platforms and allow seamless operation in a Living Lab.

2.2 Living Labs, thinking processes and knowledge management labs

The Living lab is just a tool organisations use within a cloud. However, they make integration, collaboration and optimisation possible. Living Lab is an "innovation platform" that engages all stakeholders, like end users, researchers, industrialists and policy makers at an earlier stage of the innovation process.

In the knowledge economy, knowledge became the most valuable resource for maintaining competitiveness and advantage for people or organisations. The value of knowledge management systems is the way organisations acquire knowledge and apply it after they have captured it. Living Labs also help organisations to transfer knowledge to various role players or groups.

The social media emphasise the principle of social networking. The Web is the platform for the most creative minds in the world, where the concepts of open innovation and co-creation emerge. Open innovation refers to opening the innovation process to improve the users' and other stakeholders' knowledge, creativity and skills. The idea of open innovation and co-creation are core activities and processes of a Living Lab environment.

A Living Lab turns environmental knowledge into assets and gives inherent value to the knowledge that organisations generate. From this perspective, knowledge, as an asset, also does not depreciate. Instead, it increases in value over the years because organisations can only build onto their existing assets. Knowledge cannot become outdated but organisations can improve it by adding newer knowledge. Generating knowledge and artefacts are core activities in a Living Lab to stimulate innovation, amongst others, because it is the main reason that Living Labs exist. Without knowledge, there is no business and organisations will be unable to generate solutions. Living Lab stakeholders learn to apply knowledge themselves. Knowledge management, generation and dissemination are the core of Living Lab activities, as cooking is core to restaurants. Without food, there will be no restaurants. Simply put, without knowledge and sound knowledge management, there will be no innovation and no Living Labs.

Applying knowledge means turning knowledge into action. No knowledge becomes dormant, but organisations share it so that others can capture the newer knowledge on the shared aspect. Organisations constantly reintegrate and classify earlier knowledge objects as parts of newer solutions. In turn, they speed up the process of acquiring knowledge.

Knowledge management involves connecting people with people and people with information. Technology can speed up strategic decision-making by making knowledge available through databases, intranets, virtual video conferencing, knowledge repositories and collaborative tools for sharing knowledge. Knowledge management offers a framework for balancing the numerous approaches and technologies that add value and integrating them into seamless wholes. The primary focus of knowledge management is to use information technology and tools, business processes, best practices and culture to develop and share knowledge in organisations as well as to connect those who hold the knowledge with those who need it.

2.2.1 Thinking processes as parts of a Living Labs environment

The main objective of any community-orientated Living lab is to create prosperous communities. The purpose of a Living Lab is to support core research capabilities and shared understanding in order to learn and understand the thinking processes.

Thinking is a process of working things out, knowing why and how things work or do not work. A Living Lab is a thinking and rethinking support environment, connected to generic decision-making (intelligence, design, choice and implementation) and action research (sense, learn and act) processes. Simply put, a Living Lab framework that uses thinking as its basis can function as a springboard for prosperous communities to build their entrepreneurial capacities and achieve sustainable continuous improvement.

The Living Lab approach uses systems thinking as its basis.

Systems thinking is a mindset for understanding how things work. It is a way of going beyond events, looking for patterns of behaviour or seeking underlying systemic interrelationships that are responsible for behavioural patterns and events. Systems thinking embodies a worldview. On the other hand, innovative thinking links to creative thinking and to solving problems. It generates new things or finds new ways to solve them. Explorative thinking stimulates innovation by finding patterns in data, events, design processes, research processes and decision-making. These patterns transform into knowledge and best practices in order to improve human cognition and derive fundamental insights into complex problems and systems. Analytical and critical thinking research processes support the process of discovering.

Critical thinking is the means and ends of learning. Critical thinkers should:

- remain open to new ideas and think like scientists,
- be sceptical about ways of doing things,
- use and create their own information and reject information that is irrelevant and faulty,
- state their own arguments,
- come to their own conclusions,
- listen to other people and tolerate their ways of thinking.

Strategic thinking is a way of thinking about changes and preparing for them. It is a process of helping organisations to confront changes, analyse their effects and look for new opportunities.

Simply put, performance thinking helps organisations to achieve their strategic goals. Performance thinking is the process of assessing progress toward achieving predetermined goals. Performance management builds on that process and adds the relevant communication and action to the progress organisations make in achieving their predetermined goals.

The main purpose of performance thinking is to link performance objectives with organisational strategies to increase profit. A performance problem is any gap between desired and actual results. Performance improvement is any effort targeted at closing the gap between actual results and desired results.

Process thinking focuses on identifying, understanding, designing and managing processes. Activities and related activities from workflows lead to the completion of work – objective integrated systems manage it. Workflow, architectural, real time, risk, effectiveness, maturity and intelligent services thinking support process thinking.

It is clear that, in a Living Lab environment, one needs to control the various thinking processes and to manage the subsequent processes in order to ensure that the various thinking processes result in manageable deliverables in the form of Knowledge Object as well as other knowledge artefacts and solutions.

2.2.2 The social media and knowledge management

Organisations are becoming extremely interested in the benefits of applying Web 2.0 technologies to their work practices. They include social media tools like blogs, wikis, Really Simple Syndication (RSS) feeds, sharing content, tagging and social networking. Online or Web 2.0 communities are people who share a common purpose and organisations use them to improve their business. Facebook, MySpace and Twitter are “the big three” in social networking. The researchers believe that organisations should follow a targeted approach when using social media websites based on demographics.

These social spaces play significant roles as sources and enablers of the network and knowledge factories. Tools, like blogging tools, social media tools and content sharing tools (such as Flickr and YouTube) are freely available and the only expenses they incur are Internet up-time and website maintenance. The tools have worldwide recognition and are the most popular Web 2.0 platforms because they are easy to use and support knowledge distribution between organisations and various community of practice members, both internally and externally. Community social websites intend to design a common platform for an intended purpose. It is also possible to customise websites in order to share and capture knowledge as well as to communicate with various audiences.

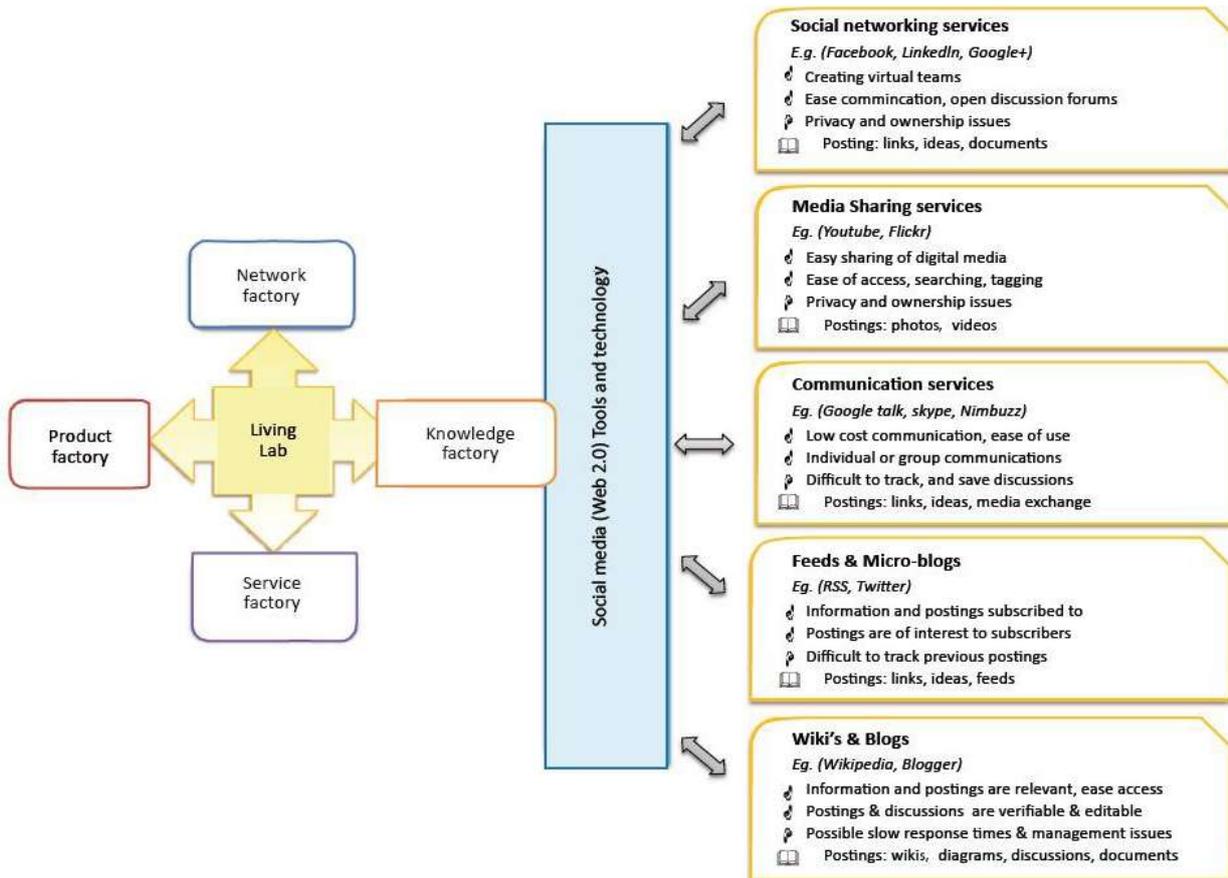


Figure 2: Examples of social media tools and technologies as part of a Living Lab.

Organisations want to benefit by engaging with a large group of people who provide knowledge. Organisations can then use this knowledge to assist them with their strategies and to improve their products and services.

The success of the social media depends on meeting the right online users in the right settings with the right messages. Knowledge management is the identification, retention, effective use and retirement of institutional insight. However, it has been an elusive goal for most organisations.

The emergence and effect of the social media on organisations forces them to rethink knowledge management and creates completely new challenges for them.

Today, one can categorise some of the core issues with existing knowledge management approaches as behavioural and technical in nature. In order for a knowledge management system to have value, employees must contribute knowledge regularly. Some researchers believe that a knowledge management system that uses Living Lab tools will achieve the best results. In a Living Lab setting, organisations achieve optimisation by transferring knowledge between experts and knowledge seekers and vice versa. Living Labs improve collaboration between many entities. This ensures that they capture up to date knowledge and more thinking can go into a subject. Involving more experts leads to specialist knowledge in the knowledge management system.

A knowledge management system, which uses Living Lab tools, is especially important for communities of practice because many experts reside outside the geographical boundaries of the Living Lab. Collaboration links with knowledge transfer and technologies. From the point of view of Living Lab tools, large groups, internal and external to communities of practice, can use many technologies in order to share and capture knowledge that is wider than the communities of practice themselves are. In a Living Lab, organisations capture data and information and then convert them into knowledge. The collaborative environment supports problem solving by applying the knowledge in the knowledge bank.

Some reasons why one should use social media are that one can use them for:

- research,
- learning from others,
- community building,
- sharing expertise,
- collaborating in real time.

2.2.3 Grounded theory

In collaborative organisational and research environments, the grounded theory process could apply in virtual teams. Therefore, it has an effect on the validity of the knowledge because groups of experts and entities in the networked domain could validate it. This process promotes the concept of “e-collaboration”. E-collaboration can be described as a new approach to forming and maintaining cooperative enterprises that involve introducing electronic communication tools to facilitate collaboration.

The grounded theory research methodology is one of the primary research activities in the Living Lab domain for discovering knowledge. The grounded theory method gives guidelines for collecting data, analysis and building inductive theory. Researchers collect data and conduct analyses in successive steps. Interpreting the data they collect in one step helps them to focus on collecting the data in the next one.

Grounded theory is described as a research method in which the theory is developed from the data, instead of the other way around. In doing so makes it an inductive approach, meaning that it moves from the specific to the more general. The study method is fundamentally based on three elements: concepts, categories and propositions, initially called ‘hypotheses’. Concepts are the key elements of analysis since the theory is developed from the data conceptualization instead of the actual data.

The grounded theory process is good for explorative research, which lead to the disciplined development of new and innovative ideas, and in developing a theory and structure in areas where there is no a prior guidance, whilst working with both qualitative and quantitative data.

2.3 Knowledge interchange and management processes

The network and knowledge factories are parts of the framework. They provide tools for communicating and disseminating information, called knowledge interchange (KI).

Knowledge interchange activities and processes correlate closely with knowledge management processes and knowledge sharing. Knowledge interchange is the process of classifying, verifying and storing information and knowledge from various sources (like other users, experts and the semantic web) in a data store like a data mart, semantic knowledge base or digital library. In other words, KI activities refer to services the portal provides to facilitate the exchange of relevant information to groups in the portal with the same interests. The knowledge and information becomes available for future retrieval to help users or communities of practice to solve their problems.

Figure 3 shows the knowledge interchange process, as part of the knowledge factory, in the living lab framework. It emphasises that organisations receive continuous feedback, verify information and knowledge throughout the knowledge interchange phases by using knowledge workers. As organisations complete adaptations and new classifications of current knowledge objects, they also keep the various knowledge factory data stores up to date.

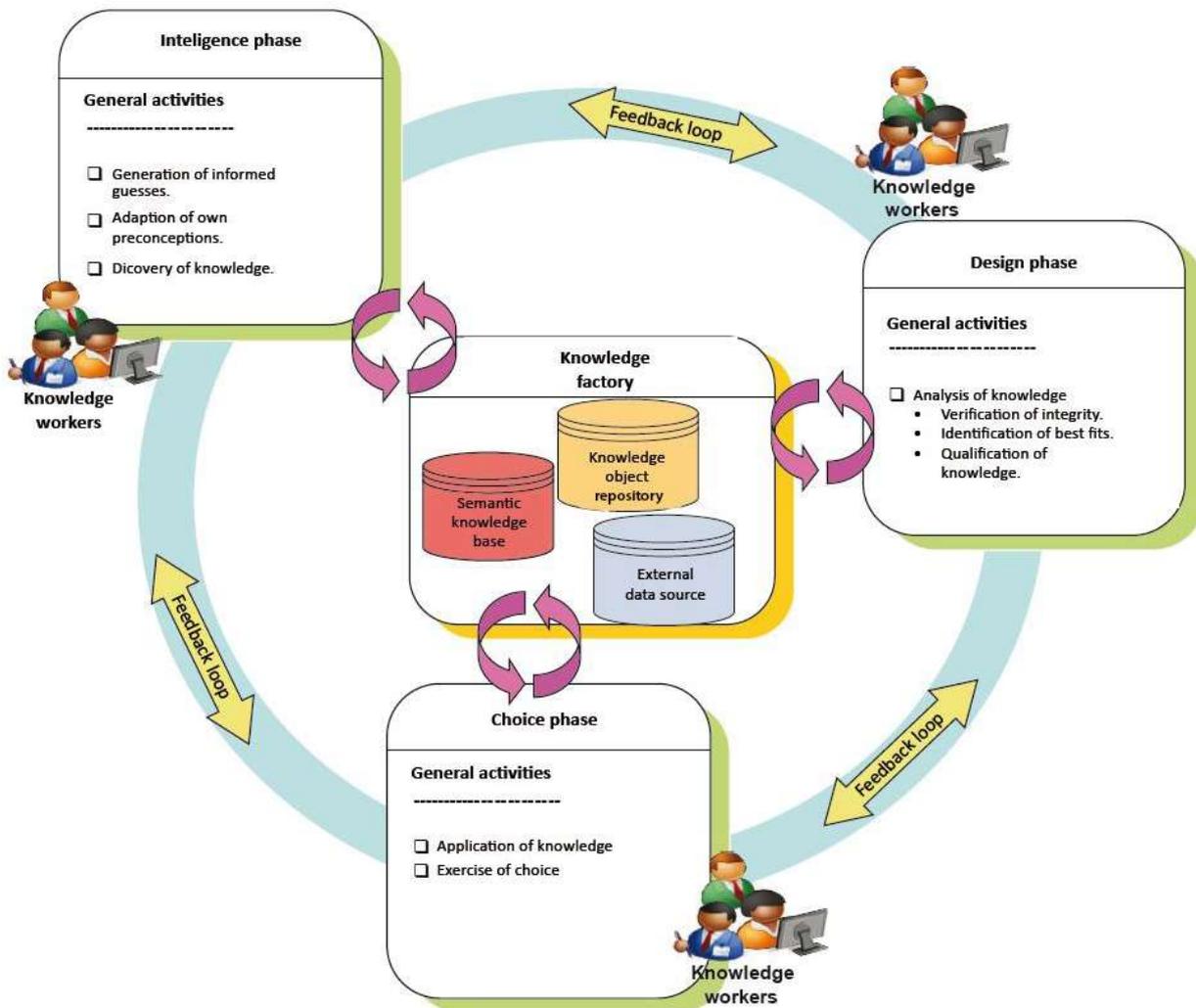


Figure 3: Knowledge interchange

One additional solution that organisations could use in conjunction with the standard knowledge interchange practices is using tools and services, which combine lexical, structural and knowledge-based techniques to exploit or generate web documents.

Organisations take advantage of the most popular Internet services. Knowledge flow relies on populating knowledge elements on the Web. Users can access all types of knowledge, information and news archives over the Internet.

Possible techniques and technologies for discovering knowledge, which use the various research activities, include:

- data and text mining,
- question and answer services,
- semantic search techniques,
- memorandums,
- sharing knowledge via social web spaces like wikis and blogs.

Organisations should remember that several knowledge servers and services, in the form of web services, might cause problems in retrieving available knowledge if they have not arranged and managed the information and knowledge they have stored properly. Furthermore, using sophisticated IT does not always guarantee successful knowledge management.

The role of knowledge is to enable users to choose rational actions so that they become vital components of competitiveness. Organisations should ensure that they receive important knowledge that many others

can use and that these contributions improve their processes or outputs. Organisations can use valuable knowledge to create differential advantage and it can affect their ability to stay ahead of their competitors.

In a Living Lab, critical operational and strategic managers are often more concerned with generating reports because they support good decision-making. Therefore, the strategies of managers will determine what the IT system should be capable of and user input will define the system further according to their needs. IT infrastructure is essential to support the implementation of knowledge creation.

2.4 Knowledge management, collaboration and the Internet

Internet social tools allow people to access, share and reuse knowledge. The Internet offers remarkable possibilities to access information and knowledge.

The Hyper Text Transfer Protocol (HTTP), mark-up technologies like the Hyper Text Mark-up Language (HTML) and Extensible Mark-up Language (XML) are key technologies for exchanging information and knowledge. Resource Description Frameworks (RDFs) are the key technologies for presenting ontologies.

XML and RDFs are two web technologies that allow for significant changes to information interchange worldwide. Many technologies, like the semantic web, have still to realise their potential. Intranets, which rely on Internet technologies, facilitate internal communication and information sharing in organisations. Multidimensional collective organisations, like Living Labs and multinational corporations, can benefit from the Internet and Intranet to gather, manage, distribute and share knowledge, internally as well as externally.

The roles of the Internet and the social media in creating the correct technological platforms for knowledge management have wide recognition. Knowledge by itself has little value unless organisations can acquire, identify, apply, manipulate and store it for later use. Technology can speed up strategic decisions by making knowledge available through databases, Intranets, virtual video conferencing, knowledge repositories and collaborative tools for sharing knowledge.

Correct technological platforms ensure that organisations capture, archive and group knowledge correctly. Knowledge management allows organisations to integrate and consolidate Intranet platforms. Organisations can benefit from knowledge management by creating and maintaining relevant knowledge repositories, improving access to knowledge, improving the knowledge environment and valuing knowledge.

Figure 4 shows the role of the Internet and includes the cloud and Intranets in the Living Lab as part of the knowledge factory. The knowledge factory allows for a general memory management cycle.

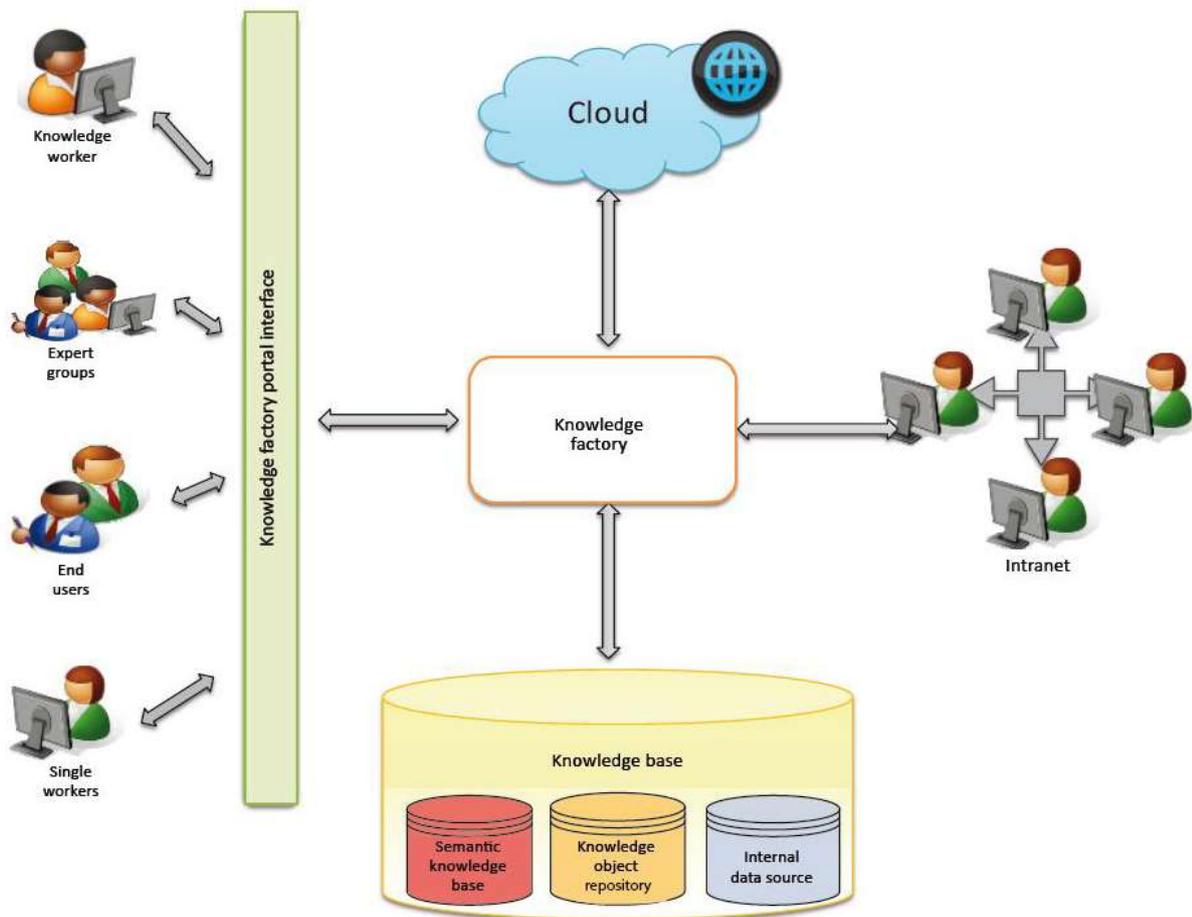


Figure 4: Position of the Internet and Intranet as knowledge sources in a Living Lab

Organisations must make human knowledge sources – like experts, normal end users and single workers from within the Living Lab environment – explicit and available in their memories. Knowledge bases, also called corporate memory bases, store and manage the knowledge. These memory bases contain KORs, which refer to artefacts of knowledge that organisations can apply in Living Lab domains and the semantic knowledge bases that include semantic references to external and internal data sources.

Knowledge objects or artefacts that organisations have referenced and catalogued in the knowledge object repository and used, as part of previous knowledge and information enquiries and searches, are available for subsequent searches. Therefore, subsequent searches could become faster because organisations can link previous knowledge to current needs.

External knowledge watchers and workers use external web sources and apply semantic tagging processes that use standard ontologies like the Dublin Core (DC) ontology (dublincore.org 2012) for metadata descriptions. Internal and external expert groups and developers develop, organise and maintain corporate memories. Experts validate knowledge elements before inserting them in the semantic knowledge base or knowledge object repository.

Normal users, which include knowledge seekers, must have easy access to the various memory elements and knowledge objects and they must be able to reuse these elements and objects in order to meet their knowledge requirements. Organisations supervise and manage their Living Lab memory environments or knowledge bases in collaborative processes to ensure that they continually verify the various knowledge stores.

2.4.1 Collaboration software on the Internet

The rise of the Internet has helped to propel collaboration. E.g. Microsoft's SharePoint software (a new generation of Internet-inspired collaboration software) provides alerts, discussion boards, document

libraries, categorisation, shared workspaces and the ability to pull in and display information from data sources outside of SharePoint itself, including the Internet, amongst others.

The social media improve organisations' knowledge management by promoting ease of use, practical results and emotional gratification through collaboration systems. The social media make it easy for people to connect with other people, who have posted specific items, with a single click. The social media could improve organisations' collaborative performance without reengineering their current knowledge management systems. For example, organisations can preserve how they store and structure information as well as integrations like workflows. Therefore, they can reduce migration costs.

The social media allow organisations to get connected and knowledge management cannot survive without connecting to groups with the same areas of interest. Being connected is all about people, knowledge and opportunities.

Quality of content on social network sites has major effects on sharing business knowledge and the subsequent value of customer relationships. However, the question of whether knowledge management and collaboration have increased in proportion to the volume of information available, and whether this information would be useful if more people could get their hands on it, remains.

If you list of world populations, which include social media platforms according to country ratings, makes for interesting reading. Facebook as the third largest "country" on the world map beating the USA. MySpace, Twitter and Orkut (as well as mobile platforms like Facebook mobile) are all in the top 20. The success of the social media lies in them being people-centred.

2.5 The Living Lab Knowledge Management framework

Figure 5 shows that various users and tools, like Web 2.0, are all possible sources of data and knowledge. The knowledge factory consists of three key systems. They comprise various services its intended user community needs to meet its knowledge support needs and requirements. The services include a KM system, a learning system and a knowledge support service. The primary objective of a KM system is to ensure the validity of the knowledge or solutions that users post. It uses the standard knowledge sharing practices that industry has adopted.

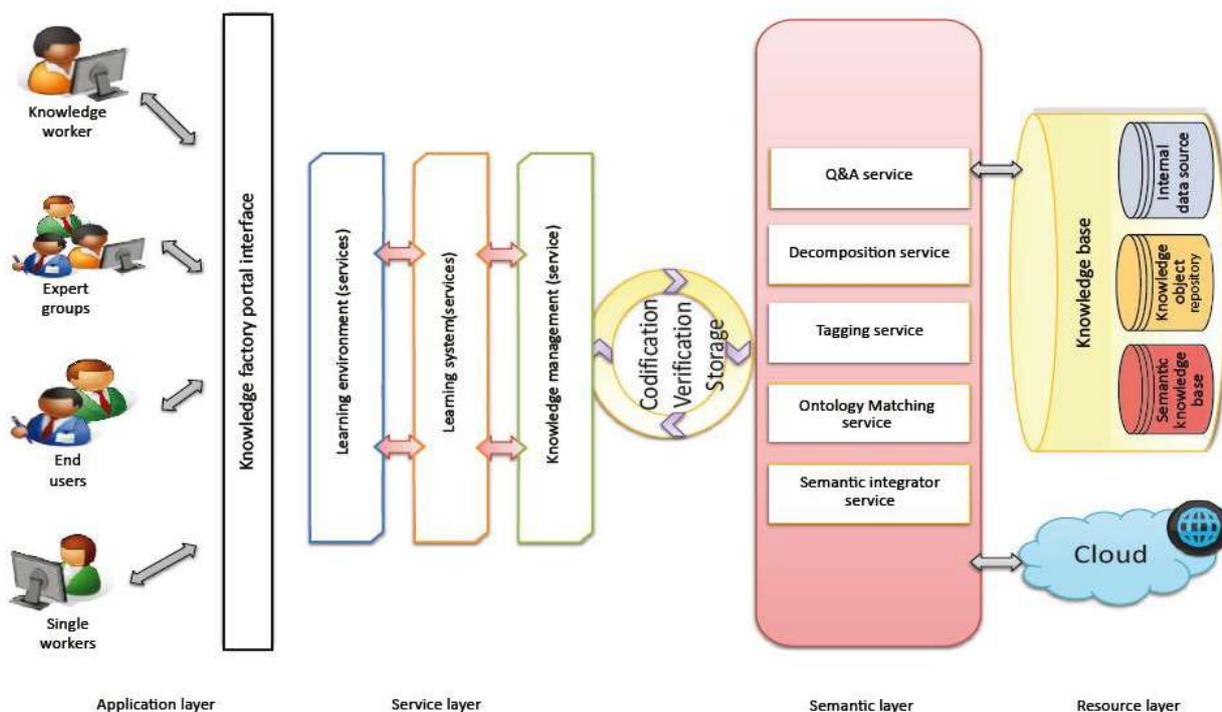


Figure 5: The Living Lab Knowledge Management Framework

A learning system (LS) means implementing the Knowledge Support Portal (KSP). It comprises many sub-portals like a Question and Answer (Q&A) portlet. The learning system acts as the physical interface

for acquiring and sharing knowledge. It also supports and enables collaboration between the various user groups. The knowledge support service orchestrates the process of acquiring information and knowledge and manages a possible reverse auction service for supplying knowledge.

The researchers' proposed framework for knowledge management within a Living Lab environment (see Figure 5) uses a layered approach. It highlights the position of the various knowledge factory systems and shows that KM activities are part of the services layer.

The application layer provides the interface that allows different users to access the various tools and the Living Lab environment. The services layer contains the various subsystems, as single or embedded tools to allow learning, and knowledge interchange in various formats. Some activities that web services could provide include sharing and clustering knowledge, generating services, providing access to smart tools, automatic tracking and tracing knowledge objects, mobile support and expert interlinking. The cloud, as web services, could render many of these services. The semantic layer provides the technical functionality and embedded process logic of the knowledge support and knowledge interchange activities. The process of classifying the question domain, which is part of the semantic layer, is a stepwise one. It processes and disseminates questions that users post via the Q&A interface and the knowledge interchange. The processes of the semantic layer follow.

They dissect and break down a posted question or request into common sentence units, like verbs, adjectives and nouns. The text mining service uses the sentence parts and performs an initial matching activity with earlier questions stored in the questions and answer repository. They apply and match similarities and artificial intelligence (AI) matching methods and return matching result-sets from the Q&A repository. They then analyse the returned result-set and original question further by using natural language processing tools and services. The ontology wrapping service uses service ontology for a Q&A web service based on OWL-S.

They write a knowledge object, that simple knowledge ontology describes, to the KOR, the repository stores, amongst others, and the metadata of stored artefacts in an external data warehouse. They also gather additional web sources using semantic processes from the Web itself. This may include links to other WEB 2.0 sites and extracting other potential KO metadata. The semantic extrapolation process generates tags that it compares to existing metadata by using semantic pattern clustering in the semantic knowledge repository. The repository matches existing classes, relations, axioms, functions and instances of earlier searches and results. The KOR contains metadata descriptions of KOs that apply to the current LL domain, whilst the semantic knowledge repository contains repository references and semantic knowledge from external domains.

The web service or semantic integrator incorporates web services with bus architecture. It uses the Web Services Description Language (WSDL) and Web Ontology Language (OWL) for retrieving and discovering possible data sources that are not part of the current Semantic Knowledge Repository (SKR). It applies this process to external web content and to external domain knowledge bases. Various knowledge officers then evaluate the results retrieved from external sources, as part of the knowledge-seeking process, as part of the research process. They tag the subsequent new knowledge or discoveries, describe them semantically and store them as part of the KOR for future use.

3 Knowledge management in virtual communities

This chapter summarizes analyses the cultural differences of communities in different regions of the world. Further on it describes possibilities, how software solutions support the collaborative work in transcultural communities and how a future solution might look like. The chapter is related to the chapter 2, but is based on a different approach.

3.1 Background

Part of many discussions in the press, in the TV, but also in weblogs or social networks, today's keyword is "globalization" and its various aspects and influences on economical events and behaviour. Nowadays, there exist visible tendencies in the development of mergers, acquisitions and co-operations of enterprises from different branches. More and more of these mergers and acquisitions operate and take place in an international context. The "global" thinking is lively embedded in smaller, locally concentrated but also in transnational-oriented enterprises. Over the last years, the possibilities to communicate between enterprises, organizations, research institutions and universities have enlarged and intensified. As per Xing founder (a social network to establish business contacts) "everyone knows everyone through maximum six corners. [...] if everyone knows everyone through six corners, the whole implicit and explicit knowledge of the world should be available through maximum six corners at the same time."

(Knopf 2007, 44). Employees or resources as the ones who are strongly involved into this communication seem to be more and more important. Only with global knowledge transfer and intercultural communication across borders and countries, they can face today's challenges. Therefore, human-beings and resources can be seen as key elements in organizations and their economic success.

In the context of knowledge management a wide variety of different virtual communities in the internet can be found. For example newsgroups, social networks and weblogs just to name some of them. People from different countries and cultures who are interested in exchanging on topics or ideas have the chance to get in contact with each other through these virtual communities. Even though these methods and tools have been developed in the global environment, today's requirements for knowledge management communities have changed during the last years.

On the one hand, they should support the international cross links (economical, technical and social) between organizations and therefore enable or facilitate knowledge transfer activities within these organizations. On the other hand, they should also try to minimize geographical distance and language barriers between users and overcome intercultural barriers and communication problems within these cultures. Technically speaking, there exist different tools for these requirements in knowledge management communities.

When treating topics like globalization as part of new working conditions, modern communication technologies and resources of organizations in the centre of all that - the impact of intercultural behaviour and cultural differences cannot be excluded. The "cultural distance" (Haghirian 2004), as well as "different languages (...) and country-specific interpretations" (Reisach 2008) can play a certain role in cyberspace communication, because they might have a strong influence on the communication itself. As part of a study in 2009, altogether 25 knowledge management communities have been analysed regarding more than 11 cultural oriented success indicators. Through this is an international comparison of knowledge management communities, the classification of cultural areas by Hall and Hofstede could be proved.

The following chapter deepens the classification of cultural areas by Hall and Hofstede by highlighting different cultures, behaviour and relationships. Different cultures and cultural backgrounds do have an influence on communication in general, but furthermore on communication in virtual surroundings.

3.2 Classification of cultural areas

To prove, whether cultural differences and country-specific interpretations have an influence on communication, the classification of cultural areas by Hall and Hofstede can be one possibility. The three dimensions help to detect a possible relation between the handling with modern communication technologies in the internet and cultural behaviour of people from different countries.

Individualism	Collectivism
<i>Autonomy, Identity from the individual</i>	<i>Integration into networks, social environment gives identity</i>
<i>Loose connection between people, personal responsibility</i>	<i>Integration into strong, bonding groups, protection</i>
<i>Direct, open, honest, sincere</i>	<i>Indirect, not linear, prefer harmony</i>
<i>e.g. USA and Europe</i>	<i>e.g. Spain, Latin America, Asia</i>

Table 1: Individualism – Collectivism (according to Hofstede)

The first dimension to classify cultures is called Individualism – Collectivism. This dimension illustrates the impact of the individual or the group within a culture and to what extent they can belong to a social structure. The second dimension Monochronic – Polychronic describes the relation to time and the handling with time. And the third dimension Low Context – High Context shows behaviour and attitudes towards information gathering and the usage of communication tools and how different cultures use modern technologies.

Monochronic	Polychronic
<i>Time is linear</i>	<i>Time is not linear</i>
<i>Exact planning, interruptions should be avoided</i>	<i>Improvisation, interruptions are normal</i>
<i>Several actions are executed one after another</i>	<i>Several actions can be executed in parallel</i>
<i>Analytical, systematically, punctual</i>	<i>Intuitive, unpunctual</i>
<i>e.g. USA, Northern Europe, Germany</i>	<i>e.g. Spain, France, Italy, Asia</i>

Table 2: Monocronic – Polychronic (according to Hall)

Low Context	High Context
<i>Communication is explicit</i>	<i>Communication more implicit, much information to be found in the context</i>
<i>Direct, clear way of communication</i>	<i>Indirect, ambiguous way of communication</i>
<i>Specific need in information</i>	<i>Specific need in social interaction, wide network</i>
<i>Short and loose interpersonal relations</i>	<i>Long and deeper interpersonal relations</i>
<i>Internet use: person - message - interaction</i>	<i>Internet use: person - person - interaction</i>
<i>Search for information through click on hyperlinks</i>	<i>Use of comments, feedback, online discussions, newsgroups</i>
<i>e.g. USA, Northern Europe, Germany, Switzerland</i>	<i>e.g. Spain, France, Italy, Asia, Latin America</i>

Table 3: Low Context – High Context (according to Hall)

3.3 Role of software as a supporting tool for Internet communities

3.3.1 Aspects of possible support

Virtual communities consist of a large number of people, who are communicating in the internet and exchange views on specific subjects. They are similar to virtual organizations (VO) in many aspects. VO is a temporary consortium or alliance of companies that work together with a common goal. Both, VOs as well as communities need support for data sharing, for communication and for sharing of resources across organizational borders. In the case of VOs various collaboration platforms are established, which provide most of these functionalities (Hayka, Langenberg, & Stark, 2010). Communities are using wikis, forums, and newsgroups, today. We propose several possibilities for additional support which can be adopted from virtual organizations.

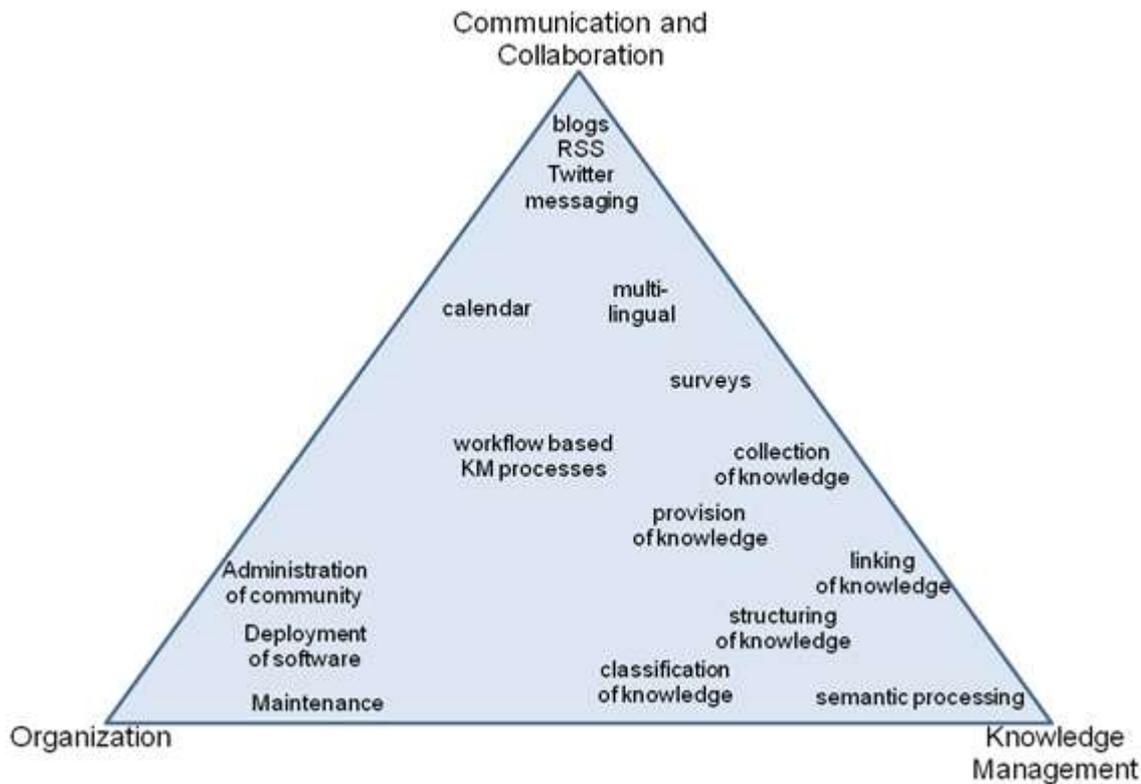


Figure 6: Software assistance for knowledge management and collaboration in Internet communities

Support for virtual communities by using collaboration and knowledge management software platforms has to meet several challenges. Firstly, communication between the community members has to be improved to reduce the geographical and cultural distances. Secondly, simplified and effective sharing of knowledge has to be enabled. A structured knowledge base is an important step to (re)use common knowledge. Thirdly, management of a community has to be simplified. Figure 6 summarizes the different possibilities for software support in Internet communities.

3.3.2 Support for communication

When we take a look at the communication aspects, we see at first the current Web 2.0 communication technologies. Especially the internet-based communities ask for the integration of these tools (weblogs, RSS, Facebook-Posts and Twitter-Feeds) into their collaboration environment. These tools help to reduce the distance between the community members virtually and to enable more interactions and spontaneous discussions.

Of course, “traditional” communication tools are needed, too. To send email messages is still required. For the communication it is important, to provide diverse solutions in the common platform because of the different cultures. For example the collectivism cultures choose approaches for open discussion in their groups. Other cultures are more focussed on the individual by using direct email or weblogs, which are focussed on the author’s opinion.

Another approach for more interaction inside of the community is to deploy workflows. Today, every member can create input and it is stored in the knowledge base. Perhaps another member reads and validates it – but not necessarily. So the quality of knowledge items in these knowledge bases varies a lot. This phenomenon is visible in most communities, even in the well-known Wikipedia community.

The implementation of workflows, which enforce reviews for every article before its publication, involves more people in the creation process and ensures a higher level of quality of documented knowledge. Finally, the knowledge becomes more a result of the entire group and new discussions are started. However, workflows mean a big change in collecting knowledge. Especially internet communities with many volunteers prefer open and less restrictive publication processes. So workflows have to be implemented in common-sense and adequate to the behaviour in the community.

Of course, there are other ways to assist interaction between community members. The knowledge platform could include further functionalities for collaboration. For example, common calendars for meetings and task management support the planning of monochromic cultures, tools for surveys and voting realize forming of opinions in collectivism influenced communities and support for implementing social networks strengthen the integration into bonding groups.

For acceptance in international communities, it is very important that the common platform is multi lingual. In many countries it is preferred to use the native language. At least the graphical user interface has to support different languages. All members should use it intuitively and should feel integrated into the community. For huge international communities, it is useful to write knowledge articles in different languages. The platform should support this multi lingual knowledge management.

3.3.3 Support for collaborative knowledge management and organizational challenges

Main functionality of the software platform is the management of the community's knowledge. It has to support collection, structuring and provision of knowledge. There are different approaches for knowledge management, for example to use a freely semi-structured wiki or a management system for knowledge articles with predefined structures. The community has to decide which approach is to be used. Independent of the chosen approach, cross linking between all knowledge items in the platform is important. There are explicit links, which are set by the users. They describe how articles are connected. Also the members can connect themselves, like it is known in social platforms. On the other side, there are various implicit links between knowledge. Categories, tags, or meta information like authors and creation time express correlations. Especially for the high context cultures this implicit knowledge is interesting, because it describes the background of an article. It is a challenge for future knowledge management platforms to make use of this implicit knowledge.

To improve the management of virtual communities, technical barriers have to be solved. Typically, the maintainers like all members of a community are interested in the domain specific topics – and not in running an information technology infrastructure. Therefore a ready-to-use solution of a specialized provider is required. Then the entire community can focus all efforts on their own topics.

3.4 Future platform for virtual communities

A future platform supports the community in their collaborative work based on the described functions. At first, currently arising cloud technologies give virtual communities new possibilities to operate their infrastructure.

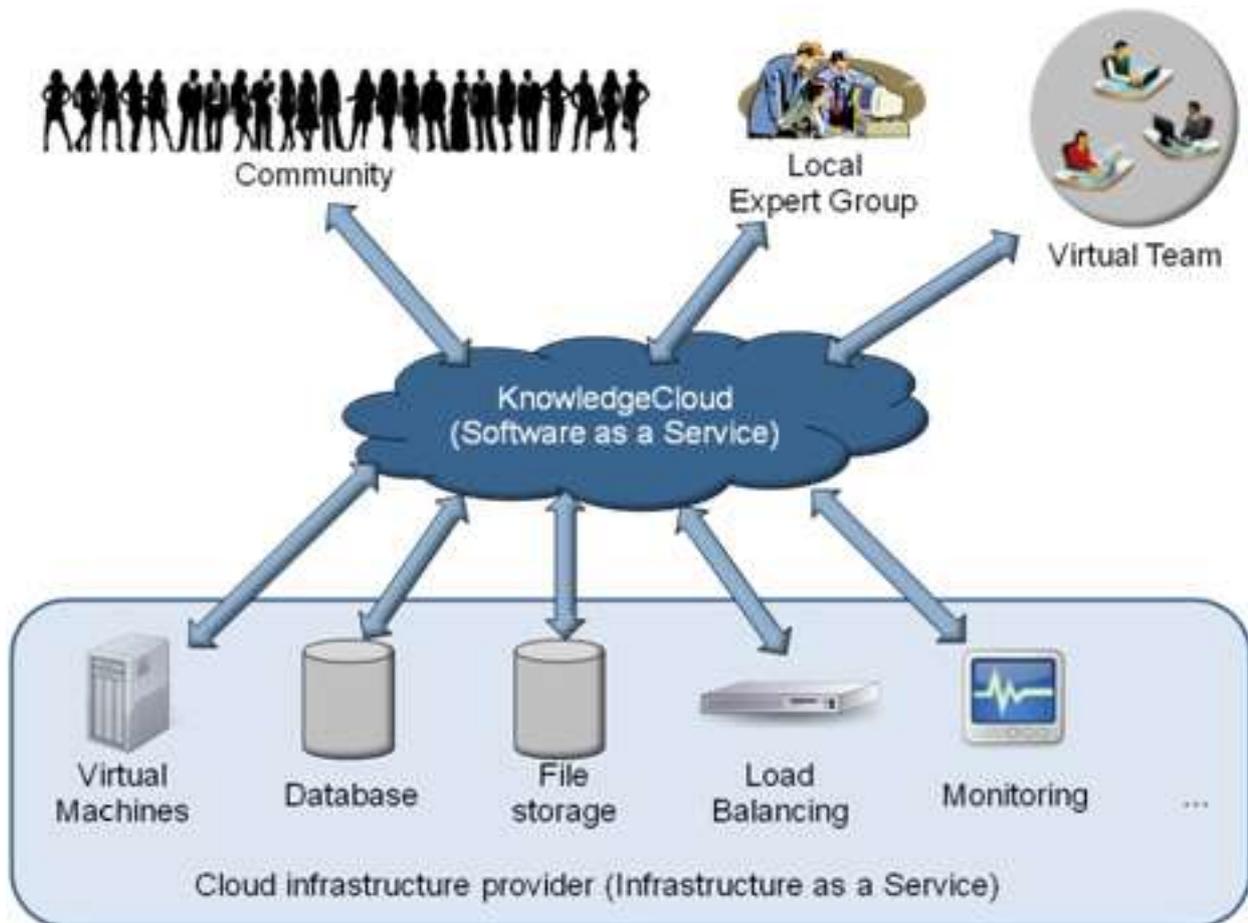


Figure 7: An example for knowledge management as a service on basis of Cloud Computing technologies

Cloud computing is a further development of grid computing technologies. Grid computing is concerned with coordinated resource sharing and problem solving in dynamic, multi-institutional virtual organizations. Cloud computing shares the same vision. Especially the current trend, providing software as a service (SaaS) on a pay-per-use basis, is interesting for virtual communities. They can buy the required IT-solution including (virtualized) hardware, setup, operation and maintenance (backups and security patches), for example a complete knowledge management and collaboration platform.

Figure 7 shows a knowledge management platform with a new architecture based on cloud technologies and providing collaboration-oriented knowledge management as a service. It's similar to the model of chapter 2, but less rigid and technology-based. So it is accessible from everywhere in the internet and none community member has to host the solution. At the same time, the availability is much higher than most community members would typically achieve.

4 Collaborative learning

Learning is more than consuming knowledge. The grand challenges to learning in knowledge societies are not limited to how effectively helping learners to acquire knowledge and skills, but in helping them to learn how to manage, work creatively with ideas and to contribute to the creation of new knowledge. By integrating learning with knowledge management, the understanding of education will be dramatically extended towards learning through practical work, lifelong learning, and self-directed learning, particularly when linked to dynamically changing circumstances.

Learning and knowledge management share a common strategy of creating a learning organization. Organizational learning implies that learning should be noted beyond individual level; an organization should be able to continuously and effectively learn and adapt to the environment. To achieve this, knowledge management is important to build an organization's intellectual assets as well as improve individual, group, and organizational performance by knowledge sharing and dissemination. Different from formal learning in educational institutions, learning in organizations serves for organizational goals

and needs, and focuses on organizational systems, structures, policies, and institutional forms of knowledge to link individual and organizational learning. The challenge is to facilitate learning in such a manner that organization, technology, and pedagogy create a coherent and manageable system for working, learning and innovation.

The integration of learning and knowledge also raises the question regarding the competences of e-learning initiatives traditionally associated with the design of learning resources. Is the creation of learning resources the whole solution to e-learning, or is it more the creation of learning environment enabling learners engaged in learning and knowledge management processes for active construction and contribution of knowledge? For example, how can we facilitate the conversion between tacit and explicit knowledge, and the development and cultivation of the channels through which knowledge flows and transfers? How will future approaches to e-learning and knowledge management reflect these concerns, and how will technologies contribute?

Collaborative learning technics may give partial answers to these questions.

4.1 VLE, CMS, LMS

The software systems designed to help teachers by facilitating the administrative and learning management of educational courses for their learners, students, are called virtual learning environment (VLE). The most universities nowadays have VLEs embedded within their usual education activity. The following levels of virtual learning environments, based on a usual pedagogical approach, are well-known:

- virtual educational site,
- virtual center for e-learning,
- virtual classroom,
- virtual library,
- virtual laboratory,
- virtual school,
- virtual department,
- virtual faculty,
- virtual university or virtual campus.

The virtual learning environments by its functions can be classified into four generation:

- The first generation of VLEs (the early 90's) can be described by static databases of learning materials, tests, discussion forums etc. with the absence of integration and interaction between separate components.
- Second generation VLEs (from the second half of 90's) are software platforms for e-learning with integrated database and organized learning process. The functions of second generation are extended in some areas: planning, administration, function for creating and supporting learning materials, function for testing student's knowledge and for getting statistics of their results but the use of modern communication and multimedia technologies is scanty.
- Third generation VLEs (nowadays in use) are much more advanced in pedagogical and administrative functions and in communication and multimedia technologies (audio conferences, videoconferences; specialized virtual "centers" and platforms for the development of educational courses, library and administrative functions, interactive environment for asynchronous and synchronous communications and online collaboration).
- The main "leitmotif" of fourth generation (nowadays in use) is intellectualization, personalization and adaptation of learning materials to the needs of each user; orientation to new learning paradigms (connectivism, social constructionism).

Present-day VLEs can be seen as software tools or platforms constructed with different types of applications. Moreover, there is a widespread, "traditional" division into content authoring/content development tools and course/learning management systems. In spite of the fact that there are very popular, sophisticated authoring tools, the most course/learning management systems more and more integrate the functions of the two types of that development tools. Because of the spreading new pedagogical paradigms the division may be unneeded.

The synonyms of VLE make the content of the term more complicated. VLEs are sometimes also called Learning Management System (LMS), Course Management System (CMS), Learning Content Management System (LCMS), Managed Learning Environment (MLE), Learning Support System (LSS) or Learning Platform (LP). A more accurate term may be a virtual environment for learning, rather than virtual learning environment; because it identifies that it is the environment which is virtual and not the learning.

Most LMSs offer the following functions, or in other terms live up to the following expectations:

Tools for educators:

- course development tools - a web platform for uploading, managing, creating, modifying resources (text, multimedia materials, simulation programs, etc.) embracing calendar, course announcements, glossary, and indexing tools,
- course syllabus development tools with the ability to structure learning units,
- quiz or survey development tool for creating tests, course evaluation etc.
- grade book,
- administrative tools to track student activity both as individuals and in groups.

Tools for students:

- password protected accounts for access to course materials,
- course content bookmarking and annotation,
- personal webpage publishing,
- accounts for access to the collaborative tools (email, discussion groups, collaborative webpage publishing),
- access to grades and progress reports,
- group work areas for collaborative webpage publishing
- self-assessment tools.

Administrative tools:

- management of student and instructor accounts and websites,
- monitoring and reporting activity,
- e-commerce tools for sale of courses,
- communication and survey tools.

Some rarer features:

- learning object management (course content management for reusability),
- e-portfolios,
- file and workflow management,
- streaming audio and video,
- access to electronic libraries,
- e-commerce module, online paying systems.

Compared to the list above, the present learning management systems often offer more sophisticated functions. Moreover, the spread of systems, based on constructivist, social constructionist or recent connectivist learning theories, attacks the mentioned functions and expectations usually based on "traditional", behaviorist principles. Learning management systems must also increasingly support common problem search and knowledge construction. Maybe the popular of these systems, Moodle lives up to not only the traditional expectations but the support for new directions of e-learning.

"Moodle is a course management system (CMS) - a free, Open Source software package designed using sound pedagogical principles, to help educators create effective online learning communities." (Moodle Docs 2008a). The abbreviation and technical term that describes the Moodle as a CMS (course management system) is acceptable, but it can be confused with the term of content management system, based on a similar structure, therefore the use of term "LMS" seems to be more expedient.

4.2 Development and characteristics of Moodle

Martin Dougiamas, an Austral software developer and research worker, at the end of '90s was very unsatisfied with the functions offered by learning management systems (WebCT, First Class, Lotus Learning Space etc.) that were widespread in those days. "I try to present a different perspective, based on developing new tools for teachers and learners to enable richer forms of dialogue combining content and communication through which teaching and learning can occur. The tools allow both teacher and learner to construct environments in their computer within which they can construct representations of their understandings of the subject and share them with others in a variety of ways." (Dougiamas, Martin, 1999)

The prototype of a new system, based on that new pedagogical approach, was trialled in 1999. "The results suggest that Moodle as it stands is relatively successful as a tool to produce structured content with work-book-like responses. Two areas needing the most improvement are internet knowledge and student interaction. This encourages me to continue development on two fronts: firstly the Internet Overview course as a tool for students to learn about the Internet; and secondly, functions within Moodle to encourage and manage educational discourse among a class of students within its content-based framework." (Dougiamas, Martin 2000) On 15 November 2001 the start of Moodle was announced. Its all-conquering success began. (Moodle Docs 2008b)

4.2.1 Pedagogical antecedents

A declared, primary source of the pedagogical creed of Moodle is Deschooling Society written by Ivan Illich in 1971. In this provoking book, Illich proposes radical and exciting reforms for the education system. In Illich's opinion schools don't answer our individual needs, supporting faked and deceptive notions of progress and development cherished by the belief that increasing production, consumption and profit are real measures for the quality of life. The universities have become recruiting centers for the members of the consumer society, certifying them for service, for the competitive rat race. Illich says the deinstitutionalizing education may be a starting point for a deinstitutionalized society.

Particularly interesting and a theoretical antecedent of Moodle is his call (in 1971!) for the use of advanced technology to support "learning webs". "Educational resources are usually labelled according to educators' curricular goals. I propose to do the contrary, to label four different approaches which enable the student to gain access to any educational resource which may help him to define and achieve his own goals:

1. Reference Services to Educational Objects – which facilitate access to things or processes used for formal learning. Some of these things can be reserved for this purpose, stored in libraries, rental agencies, laboratories, and showrooms like museums and theaters; others can be in daily use in factories, airports, or on farms, but made available to students as apprentices or on off hours.
2. Skill Exchanges – which permit persons to list their skills, the conditions under which they are willing to serve as models for others who want to learn these skills, and the addresses at which they can be reached.
3. Peer-Matching – a communications network which permits persons to describe the learning activity in which they wish to engage, in the hope of finding a partner for the inquiry.
4. Reference Services to Educators-at-Large – who can be listed in a directory giving the addresses and self-descriptions of professionals, paraprofessionals, and free-lancers, along with conditions of access to their services. Such educators, as we will see, could be chosen by polling or consulting their former clients." (Illich, Ivan 2008)

The concrete details of plan proposed by Illich in 1971 reflect the technical level of those days, so seem to be technically out-dated. However the four points of this proposal can be interpretable as important antecedents of constructivist, social constructionist philosophy preferred by the developers of Moodle.

Constructivism asserts that people actively build new knowledge as they interact with their environment. Every-thing you perceive is tested against your prior knowledge and if it is viable within your mental world, may form new knowledge you carry with you. Constructionism extends the ideas of constructivism and maintains that learning is particularly effective when constructing something for others to experience. Social constructivism or constructionism extends the above "isms" into a social group building things for one another, collaboratively creating a small culture of shared artifacts with shared meanings.

4.2.2 Features of Moodle in short

Moodle has more features than you would expect from an average learning management system. Because of its free software (open source and free) license and modular construction it can readily be extended by creating plug-ins for specific new functionality. Moodle supports many types of plug-ins:

- activities,
- resource types,
- question types,
- data field types (for the database activity),
- graphical themes,
- authentication methods,
- enrolment methods,
- content filters.

PHP is usable to author and contribute new modules. Moodle's development has been accelerated by the work of open source programmers. It has contributed to its fast development and rapid bug fixes. Hundreds of sophisticated modules created by enthusiastic developers can be downloaded from <http://moodle.org>.

The most popular core modules:

- Assignment module,
- Chat module,
- Choice module,
- Database module,
- Forum module,
- Glossary module,
- "Hotpot" module,
- Lesson module,
- Quiz module,
- Resource module,
- SCORM module,
- Survey module,
- Wiki module,
- Workshop module.

Moodle runs without alteration on Unix, Linux, FreeBSD, Windows, Mac OS X, NetWare and any other systems that support PHP, including most webhost providers without those offer free webhost services. Data is stored in a single database (MySQL, PostgreSQL, Oracle or Microsoft SQL). The newer versions of Moodle were released with improved roles management.

Moodle has a significant user base with over 66,734 registered sites with 58 million users in 6.2 million courses. (As of June 5 2012)

In short, Moodle is the most popular among free, open-source LMSs and one of the most popular LMSs in general.

The Moodle has rich dimensions to interoperability for e-learning systems:

- authentication, using LDAP, Shibboleth, or various other standard methods (e.g. IMAP),
- enrollment, using IMS Enterprise among other standard methods, or by direct interaction with an external database,
- quizzes and quiz questions, allowing import/export in a number of formats: GIFT (Moodle's own format), IMS QTI, XML and XHTML,

- resources, using IMS Content Packaging, SCORM, AICC (CBT), LAMS,
- integration with other Content Management Systems such as Postnuke (via third-party extensions),
- syndication using RSS or Atom newsfeeds - external newsfeeds can be displayed in a course, and forums, blogs, and other features can be made available to others as newsfeeds.

Moodle also has import features for use with other specific systems, such as importing quizzes or entire courses.

Moodle support to Social Constructionist views

The declared social constructionist features in Moodle are the following (Moodle Docs 2008c):

"All of us are potential teachers as well as learners - in a true collaborative environment we are both"

Lots of activities in Moodle are constructed to allow students to control the shared, common content of courses, such as forums, wikis, glossaries, databases, messaging etc. This stimulates students to share course experience for others.

"We learn particularly well from the act of creating or expressing something for others to see"

Moodle has a lots of ways in which people can create representations of their knowledge and share them:

- The course structure itself is an important way to construct a shared representation of the learning "path" that everyone can go through.
- Forums are spaces for discussion and sharing of media and documents (media plug-in filters, attachments, hyperlinks).
- Wikis are outstanding tools for group work and other discussions.
- Glossaries are collaboratively-built "cyclopaedias" that can then appear throughout the course.
- Databases allow participants to enter structured media of any type.

"We learn a lot by just observing the activity of our peers"

The participants' page, the "online users" block, the "recent activity" block are the main places where you can see everyone's activity in your course.

"By understanding the contexts of others, we can teach in a more transformational way (constructivism)"

There are many different ways to find out about the participants:

- The user profile includes fields where participants can provide information about their background.
- Blogs allow people to express thoughts in a public but reflective way.
- Activity reports show all the contributions from a participant in a course.
- Log reports show detailed logs of every action taken by a participant in Moodle.
- The survey modules provide a variety of questionnaire tools.

"A learning environment needs to be flexible and adaptable, so that it can quickly respond to the needs of the participants within it"

- You can create flexible and easily adaptable courses in different ways:
- The course page itself allowing the teachers to structure and restructure activities if necessary.
- The roles from Moodle 1.7 can be applied individually in every context.
- Preferences of appearance and behaviour allowing educators to fine-tune the behaviour of Moodle in many ways.
- External systems can be integrated into Moodle, to maintain authentication, enrolments etc.

4.3 Networks, communication overload and knowledge map

A characteristic feature of traditional teaching in industrial societies is the hierarchical distribution of knowledge.

The model form of this is the non-interactive conventional lecture with a top to bottom transmission of information. In the framework of traditional seminars discussion and communication takes place within a restricted temporal and spatial framework. The limited circulation of printed books make it necessary for professors to hold a lecture based on their own course books (or to imply read them out) and the students try to note down what they hear just as students did in the Middle Ages. In the framework of traditional seminars discussion and communication takes place within a restricted temporal and spatial framework.

The new communicational tools expand these limitations. Technology in the information society enables the organisation of persons, knowledge warehouses and institutions into networks. With the help of Web2-based technology the teacher and students are able to keep in constant contact with each other with no temporal or spatial hindrance. The teacher can be reached anywhere by electronic mail. The teaching material (and even teachers' lectures) can be accessed and commented on from any Internet workstation in the world – as can the students' work posted on the Internet. The students can independently upload the knowledge material and can easily store their tasks and comments in a learning environment.

The whole process is a big opportunity for learning activities, learning courses in SMEs which haven't enough resources and time for traditional learning.

However, this opportunity also gives rise to new problems. One of these is information overload. In network learning essays, exercises and requests for support can be forwarded quickly and efficiently by electronic mail. However, if the teacher remains the only source of knowledge and the only tutor, sooner or later he/she will be lost amidst the overwhelming amount of electronically stored texts, exercises and messages.

Thus, a contradiction arises, namely that if network education is used in the traditional system of centralised knowledge distribution with every student turning to the teacher with their questions and everything else, and the teacher checking every step of the knowledge acquisition process, this will in the short term lead to an unmanageable overload of information.

The methods of traditionally centralised knowledge distribution and the opportunities afforded by the network are thus difficult to reconcile. The network virtually forces learning from one another, i.e. decentralised knowledge distribution. In this system students have to learn from each other and ask for help from other tutors. Following this path frees the teacher from information overload. However, this method is only possible if we know what kind of experience, knowledge and competence the other network partners have, since armed with such facts we can decide whom to turn to with what questions. This can be facilitated by the exploration, storage and presentation of personal knowledge, which necessitates the creation of personal e-portfolios and knowledge maps.

Hence, a whole new series of questions arose:

- Do the students have the knowledge (informal, tacit, experiential) that fits in with the themes of the course?
- Do the students need to adjust to the course or does the course have to be adjusted to their preliminary knowledge?
- How can students learn from one another (and indeed how can they be taught), if personal knowledge is not represented? Does the present organisational framework have the potential for such intensive work to be done so that individual competence-portfolios and knowledge maps enabling students to use each other as sources of knowledge could be created?
- How does the role of the teacher change in such an operational method?
- What does the "knowledge" which must be transferred actually mean?

If we take co-operative, network learning seriously and also take it seriously that students use each other as a source of information (and we involve the experts of other universities in tutoring), a professional competence-portfolio system facilitating well-documented and generally accessible sources of information needs to be set up. This necessitates a well-constructed internal knowledge-management base and that other universities be part of the knowledge network (in a technical sense too). Such logistics require that every participant has an individual (professional) knowledge map and competence-portfolio.

Again, several questions arise:

- What should be included in the knowledge maps?
- How can knowledge intended to be used by others be understood and recorded?

- How should we go about self-exploration through which tacit knowledge and informal experiences acquired in everyday life, can come to the surface and be made explicit?
- How can we articulate this and give it form?

With the help of narrative knowledge management it is possible to reveal the tacit knowledge of individuals and organisations through an analysis of narratives. The students' introduction of themselves is the first such narratives. A whole storehouse of life experience can be revealed during these narratives. The success stories built into these narratives provide help in formulating the speaker's tacit, experiential knowledge.¹

The function of the database-management function (wiki) built into Moodle provides help in the preparation of an e-portfolio, for which the following short list of possible themes can be proposed:

- learning biography,
- learning style,
- completed tests, exercises,
- selected sources of study,
- hobbies,
- success stories,
- family background,
- participation in real and virtual social networks,
- work experience,
- experience abroad,
- knowledge map.

The competence-portfolio table planned through joint work serves the goal of guiding students in the preparation of their own individual knowledge map, thus providing a source of knowledge, which is more systematic and easier to document than biographical narratives.

We can supply the particular competence-requirements (learning objectives) of the chapters in a separate list. The students are able to give marks for each item of the competence-list at the beginning and end of the course, which allows them to follow the development of their knowledge.

4.4 "Creative projects"

In every instance Internet supported tasks can be assigned to the competences that are to be mastered. We can design these project-type tasks in such a way that their completion would lead to the acquisition of the desired competence. In theory, the students are able to select those tasks to complete which (revealed with the help of the competence catalogue) can compensate for their gaps in knowledge. All of these elements of the integrated learning environment (competence catalogue, project ideas, information, opportunities for self-evaluation and communication) enable participants to develop that particular competence that they are the most motivated to achieve based on their personal drive. Toolbars containing checklists, tables, flowcharts and methodology guides, as well as accessible lists of online and printed literature can be provided for the projects.

Exploiting the opportunities provided by the Internet and Moodle, we can organise search, knowledge management and database development projects. The chapters can contain self-fill-in multiple choice test questions and traditional revision questions.

Which are the typical tasks and creative projects of the course that could be used for every chapter?

4.4.1 Glossary development

The students look into whether there are expressions in the text of the chapter which they cannot understand. These are placed in the glossary (lexicon) of the given chapter. If they are not able to find a suitable definition, they then use the Internet to find explanations that help them to understand the

expression. These are stored in the glossary of each chapter. Thus, by the end of the semester a glossary is developed through collective work, which helps with individual problems of understanding.

4.4.2 Analysis of Internet forums

The students select an Internet forum suitable for the topics of the chapter and analyse it in regard to what kind of information exchange is taking place in them. Possible questions:

- Information flow (centralised vs. decentralised diffusion of information).
- Content of information (alternatively: their position on the data, information, knowledge/master knowledge scale – relative to the level of the question posed).
- The degree of information-spread/proliferation spontaneity/organisation.
- The relevance of the information to the set objective.
- The degree to which the credibility of the information can be validated.

The students organise a type of information exchange forum in which their own collection of links, parts of texts and book titles connected to the chapter can be stored, and these can be exchanged and commented on by them. They organise debates on the Internet forum on selected problems from the chapter.

4.4.3 E-portfolio

The students make their own e-portfolios with the assistance of Moodle's (or other LMS's) wiki function. The e-portfolio facilitates network, co-operative learning. One of the important points when creating the e-portfolio must be that when a given piece of information is provided it must help the other participants of the network to understand the tacit knowledge and knowledge source the portfolio's maker offers.

4.4.4 Learning diary (blog)

The students can comment on their own learning experiences in Moodle's blog. The suggestions, ideas and difficulties they express provide help in the ongoing development of the course.

4.4.5 Essay on personal experiences

In an essay (a short, informal study, a report on events, or a diary) the students describe their personal experiences related to the topics.

4.5 Digital storytelling

Storytelling is an ancient art form and a valuable form of human expression.

Storytelling is also an ancient form of teaching. Before books or reading and writing became widely spread and available, oral storytelling was the only form wisdom and knowledge of the people were passed down from elders to children. Nowadays, technology has given us a new twist to this ancient teaching method. We are incorporating storytelling to paint a picture of our world in order to teach others about our knowledge, culture and people once again. Digital storytelling gives us the ability to reach and disseminate our stories further than ever before in history. Storytelling, no matter in what form or media created in, is a powerful tool to transmit knowledge, culture, perspectives and points of view.

Storytelling is the interactive art of using words and actions to reveal the elements and images of a story while encouraging the listener's imagination. The main characteristics of storytelling:

- Storytelling is interactive.
- Storytelling uses words.
- Storytelling uses actions such as vocalization, physical movement and/or gesture.
- Storytelling presents a story.
- Storytelling encourages the active imagination of the listeners.

All these components together make a great recipe. It creates an opportunity that allows students to truly use cross-subject skills and knowledge. Students can be creators of new stories, but also listeners of stories created by others who are unlike them. These components can be adjusted and appropriately

tuned by the storyteller to the age level and knowledge of the intended audience. Wherever there is a story told, there are listeners exploring new worlds, scenarios and developing critical thinking skills to connect them to their world and their own experiences.

Storytelling is a useful teaching tool, not only for language arts but science as well. It's a widely-usable tool in an SME too. A Story is a basic principle of mind. Most of our experience, our knowledge, and our thinking is organized as stories. The mental scope of story is magnified by projection - one story helps us make sense of another. The projection of one story onto another is parable, a basic cognitive principle that shows up everywhere, from simple actions like telling time to complex literary creations.

New technology tools allow us to connect, communicate and collaborate easily with others around the world. Stories are all about these three C's and lend themselves naturally to create a bridge between teaching and integrating technology. Digital Storytelling is a tool that can support teaching and learning in any subject area.

- We connect on an emotional level with people and events in stories and we connect them to experiences in our own lives.
- Stories let us communicate our perspective and perception.
- Stories are usually a collaborative effort of stories' characters, their actions and points of view. Stories that have been passed down through generations allow voices from the past to be intermingled with voices from the present. Remixing and re-makes of stories add new twists, allow new perspectives, and shed new light storylines.

Available tools for digital storytelling:

- **Audacity** is a free digital audio editor and recording application, available for Windows, Mac OS X, Linux and other operating systems. <http://audacity.sourceforge.net/>
- **Google Maps** is a web mapping service application and technology provided by Google. <https://maps.google.com/>
- **Microsoft Photo Story** is a free application that allows users to create a visual story (show and tell presentation) from their digital photos. <http://www.microsoft.com/en-us/download/details.aspx?id=11132>
- **Mixbook** is a free, online service to make customizable photo books, cards, and calendars on the web. <http://www.mixbook.com>
- **VoiceThread** is a collaborative, multimedia slide show that holds images, documents, and videos and allows people to navigate slides and leave comments in 5 ways - using voice (with a mic or telephone), text, audio file, or video (via a webcam). <http://voicethread.com>
- **Windows Live Movie Maker** is a video creating/editing software that is a part of Microsoft's Windows Live initiative. <http://download.live.com/moviemaker>
- **Wordle** is a toy for generating "word clouds" from text that you provide. <http://www.wordle.net/>
- Etc.

5 Acknowledgements

This content is made available under [Creative Commons Attribution-NonCommercial 3.0 Unported \(CC BY-NC 3.0\)](https://creativecommons.org/licenses/by-nc/3.0/)

The unit has been mainly adapted from the following contents:

Bessenyei I. - Tóth Zs. (2008): E-learning experiences in the NETIS project, in: Netis Text Book, http://www.ittk.hu/netis/doc/textbook/Toth_Bessenyei_moodle_eng.pdf

De Jager, L. - Buitendag, A.A.K. - Van der Walt, J.S., (2012): Presenting a framework for knowledge management within a web-enabled Living Lab, SA Journal of Information Management 14(1), Art. #506, 13 pages. <http://dx.doi.org/10.4102/sajim.v14i1.506>

Langenberg, D. - Welker, M. (2011): Knowledge management in virtual communities, <http://www.community-of-knowledge.de/beitrag/knowledge-management-in-virtual-communities/>

Tolisano S. R.: Digital storytelling, Tools for Educators, <http://langwitches.org/blog/wp-content/uploads/2009/12/Digital-Storytelling-Guide-by-Silvia-Rosenthal-Tolisano.pdf>

Tóth Zsolt – Bessenyei István (2008): Moodle and social constructivism, in: Netis Text Book, http://www.ittk.hu/netis/doc/textbook/bessenyei_toth_elearning_eng.pdf

Wang, M. - Yang, S. J. H. (2009): Knowledge management and E-learning, Knowledge Management & E-Learning: An International Journal, Vol.1, No.1 1 <http://www.kmel-journal.org/ojs/index.php/online-publication/article/view/1/9>

6 Other references

Charmaz, K. (2000): Grounded Theory: Objectivist and Constructivist Methods, in N. Denzin & Lincoln, Y. (eds.), The Handbook of Qualitative Research, vol. 2, pp. 509–535, Sage Publications, New York.

Davidson, A.L. (2002): Grounded Theory – Defined, http://www.essortment.com/all/groundedtheory_rmnf.htm (Accessed: 28 May 2012)

Dieng, R. (2002): Corporate KM through Intranet and Internet, Web Technologies, ERCIM News 41(3), pp. 14–17.

Doyle, A. (2012): Social Media – Social Media Definition, <http://jobsearch.about.com/od/networking/g/socialmedia.htm>, (Accessed: 24 May 2012)

Dougiamas, Martin (1999): Developing tools to foster online educational dialogue, The Proceedings of the 8th Annual Teaching Learning Forum, The University of Western Australia, 3-4 February 1999

Dryndos, J. - Kazi, A. S. - Langenberg, D. - Löh, H. - & Stark, R. (2008): Collaborative Virtual Engineering for SMEs: Technical Architecture. In K.-D. Thoben, K. S. Pawar, & R. Gonçalves (Eds.), 14th International Conference on Concurrent Enterprising (ICE) 2008, pp. 507–514. Retrieved from www.ice-proceedings.org/Projects/408/ICE_2008/Virtual_Engineering_&_Manufacturing/060_CWE14_2_ICE2008_CoVES_Technical_Architecture_SS4_IP2_3.pdf.

Haghirian, P. (2004): Interkultureller Wissenstransfer- strategisch unverzichtbar für Global Player. In: Wissensmanagement- Das Magazin für Führungskräfte, No. 4, pp. 48–50.

Foster, I. - Kesselman, C. - Tuecke, S. (2001): The anatomy of the grid: Enabling scalable virtual organizations. International Journal of High Performance Computing Applications, 15(3), pp. 200-222.

Foster, I. - Zhao, Y. - Raicu, I. - Lu, S. (2008): Cloud Computing and Grid Computing 360-Degree Compared. 2008 Grid Computing Environments Workshop, Vol. abs/0901.0, pp. 1-10. IEEE. doi: 10.1109/GCE.2008.4738445.

Hall, E. T. - Hall, M. R. (1990): Understanding cultural differences, Intercultural Press

Hayka, H. - Langenberg, D. - Stark, R. (2010): Kooperationsplattformen für virtuelle Unternehmen. ZWF Zeitschrift für wirtschaftlichen Fabrikbetrieb, 105(7-8), pp. 693-699.

Hofstede, G. H. (1993). Interkulturelle Zusammenarbeit: Kulturen-Organisationen-Management, Gabler

Illich, Ivan (2008) Deschooling Society. Chapter 6 - Learning Webs <http://www.preservenet.com/theory/Illich/Deschooling/chap6.html> (Accessed: 28 May 2012)

Kaps, Ines (2011): Barriers in intercultural knowledge sharing, <http://www.community-of-knowledge.de/beitrag/barriers-in-intercultural-knowledge-sharing/>

Knoof, T. (2007): Wissen vermehren dank neuer Community-Strategien. In: Wissensmanagement - Das Magazin für Führungskräfte, No. 8, pp. 44–45.

Linde, Charlotte (2001): Narrative and social tacit knowledge, in: Journal of Knowledge Management, 5/2, pp. 160-171.,

<http://www.emeraldinsight.com/Insight/viewContentItem.do?contentType=Article&contentId=8>

83733, (Accessed: 8 June 2012)

Moodle Docs (2008a): <http://moodle.org/> (Accessed: 30 May 2012)

Moodle Docs (2008a): <http://moodle.org/> (Accessed: 30 May 2012)

Moodle Docs (2008b): Welcome to Moodle!, <http://moodle.org/mod/forum/discuss.php?d=1> (Accessed: 30 May 2012)

Muller, M. (2010): Grounded Theory Methods, Human-Computer Interaction Consortium, Winter Park, Colorado, February 24–28, www.slideshare.net/traincroft/grounded-theory-method-hcic-2010-muller (Accessed: 28 May 2012)

Nabil, S. (2010): Cloud computing for education: A new dawn? *International Journal of Information Management* 30(2), 109–116. <http://dx.doi.org/10.1016/j.ijinfomgt.2009.09.004>

Reisach, U. (2008): Kulturelle Unterschiede im Umgang mit Wissen - Beispiele aus der Wirtschaftspraxis in Deutschland, USA und China. In: Gronau, Norbert/ Eversheim, Walter (Hg.): *Umgang mit Wissen im interkulturellen Vergleich. Beiträge aus Forschung und Unternehmenspraxis*. acatech Workshop Potsdam 20.Mai 2008. Stuttgart: Fraunhofer IRB Verlag (acatech diskutiert), pp. 97–125.

Tice, D. (2011): Report: OTT Video Viewing Up by One Third in 2011, in: *Telecompetitor*, <http://www.telecompetitor.com/report-ott-video-viewing-up-by-one-third-in-2011/> (Accessed: 30 May 2012)

Wikipedia (2012): Knowledge management, http://en.wikipedia.org/wiki/Knowledge_management (Accessed: 30 May 2012)

