Lecture 05:

Knowledge Management Systems and KM Tools

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Learning objectives

Learners should

- understand the role of information technology in the context of knowledge management
- be able to give an overview of technologies and tools available and used for knowledge management
- be familiar with classification schemas for KM tools and be able to explain the difference between technologies, tools and KM systems
- know the function of an ideal knowledge management system
- understand the role of architectural concepts for the design of knowledge management systems and also the contribution of knowledge engineering
- be able to describe practical examples of KM tools and know which KM activities can be supported by which tools

Content

- Role of Information Technology in KM
- Classification of KM Tools and Technologies
- Knowledge Management Systems
- Knowledge Engineering
- Examples
  - Yellow Pages
  - Mind Mapping Tools
- Summary – Myth on Knowledge Management
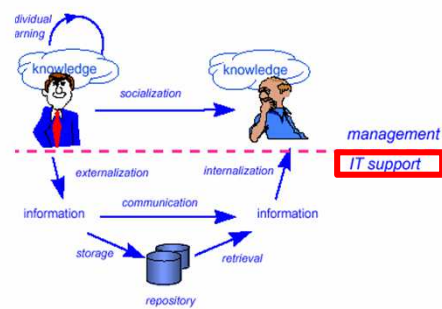
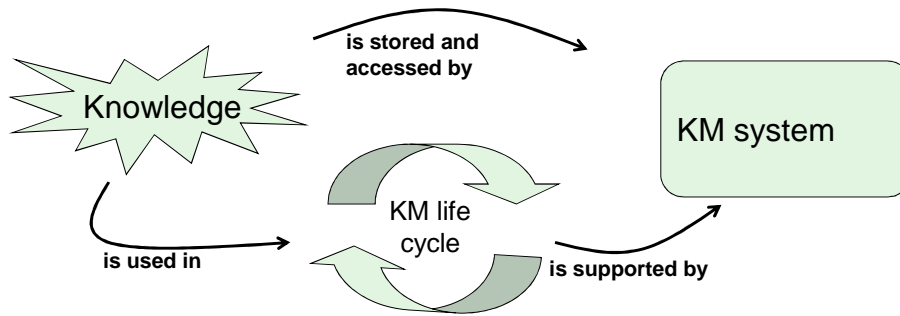# (1) Role of Information Technology in KM

General Role of IT in Business

enable

Business strategy

IT and information systems

align
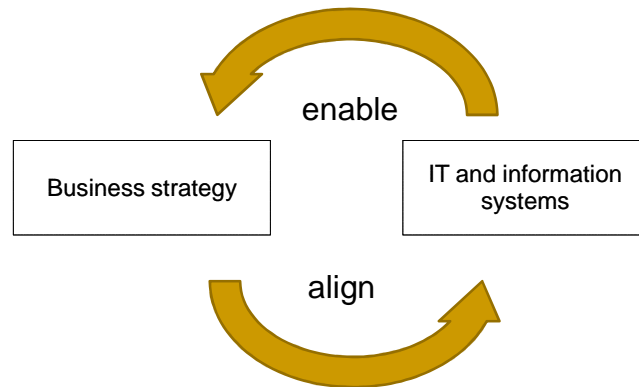
IT as enabler for knowledge management
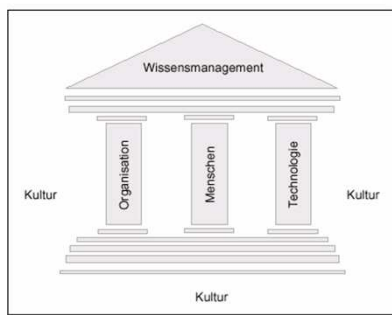
KM intervention levels

Relation of terms: Knowledge, Knowledge Life Cycle, Knowledge Management System
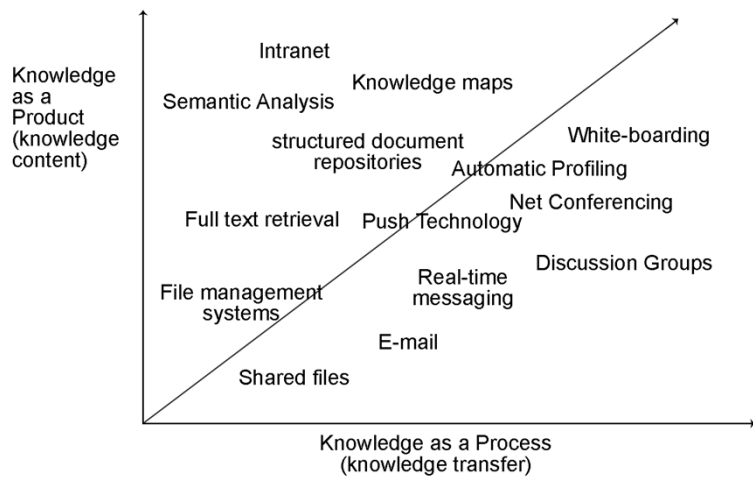
Knowledge

is stored and accessed by

KM system

KM life cycle

is used in

is supported by

(adapted from MOCURIS)

Knowledge Management Systems

Skill Database

Extended CRM

Knowledge Maps

Knowledge Push

Cooperating Portals

Knowledge Portal

E-Learning Platform

KMS metaphor

Related terms

Meta-Search Engine

KM Suite

Community Homespace

Knowledge-related application

Organizational Knowledge Base

Integrative KMS

Interactive KMS

Support KMS deployment

Enterprise Knowledge Medium

Organizational Learning

Transactive Memory System

Knowledge Management System (KMS)

Knowledge Management

Organizational Memory System

Organizational Memory

Organizational Memory Information System

Other focus

AI-technology

Related theoretical concepts

Technological roots

Search Engines

Visualization Systems

Provide available ICT basis

Business Intelligence Tools

Intranet/Groupware Platform

CBT/ Learning Environments

Data Warehouse

Document Management Systems

Workflow Management Systems

Group Support Systems

Communication Systems (e.g.. e-mail, video conferences)

(Maier 2002)

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KM Tool Support

Knowledge
as a
Product
(knowledge
content)

Intranet

Knowledge maps

Semantic Analysis

White-boarding

structured document
repositories

Automatic Profiling

Net Conferencing

Full text retrieval   Push Technology

Discussion Groups

Real-time
messaging

File management
systems

E-mail

Shared files

Knowledge as a Process
(knowledge transfer)

(Bick, 2008)

(2) Classification of KM-Tools and Technologies

General Classification

- ## Basic Technologies
  Fundamental technologies like databases, internet / intranet, ontologies)

- ## Specialised Tools and Systems
  Designed for other purposes, but also applicable for KM (e.g. search engines, document management systems)

- ## Knowledge Management System (KMS)
  Designed to support KM explicitly, extensive KM support, are using KM methods or support KM functions
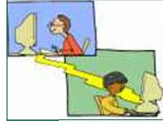
KM Tools according to the SECI model

- Tools for knowledge socialization
- Tools for knowledge externalization
- Tools for knowledge combination
- Tools for knowledge internalization

Source: *Knowledge-Creating Company*

Tools for knowledge socialization

- Chat systems

- Video conferencing

- Web conferencing

- Digital Whiteboards

- Bulletin boards

(adapted from MOCURIS)

Tools for knowledge externalization

- Expert Systems
- Knowledge Mapping Systems
- Yellow Pages
- Databases
- Data Warehouses

Tools for knowledge combination

- Internet
- Intranet
- Groupware
- Forums
- Workflow systems
- Tacit active net
- Tacit Knowledge Mail

Tools for knowledge internalization

- Learning Management Systems
- Case-based Reasoning Systems

Technologies and systems for KM

Groupware systems	Content & storage systems	Artificial intelligence systems	Executive information systems	Other systems
• Communi-cation systems • Cooperation systems • Coordination systems	• Document management systems • Content management systems • Portal systems • Learning management systems	• Expert systems • Agent systems • Text mining systems	• Data warehouse • OLAP systems • Data mining systems	• Information support and Search services • Visualization systems

Groupware

- **_Groupware_** refers to programs or software that help people work together collectively across a distributed *system* so that all users can view the same information.

- Systems for exchanging textual, visual or audible or audio-visual information

- Support collaboration, coordination and cooperation of actors

- Important for establishing the organizational knowledge base

Groupware - Communication Systems Examples

- E-Mail systems
- Newsgroup – Bulletin board for a specific topic, message is delivered e-mail based to a group of recipients
- Listserver – E-Mail based, subscription to specific topics, e-mails from a sender of a topic are delivered to all subscribers
- Chat systems
- Instant Messenger – send textual information, status information, send files, video and audio conferences
- Audio- and video conference systems

Support of KM activities
- Spread knowledge
- Help and support (= knowledge development)

Groupware - Cooperation Systems

Support collaboration among spatial and temporal distributed users; due to this also supporting knowledge development (collective knowledge) and knowledge distribution among the participants.

Different Types of Cooperation Systems

- Planning systems
- Annotation systems
- Group-orientated processing systems
- Electronic meeting systems
- Workflowmanagement Systems

Support of KM activities
- Modeling of knowledge intense business processes
- Automation of knowledge processes

Content- and Storage Systems

- Software solutions for storing and archiving data, information or knowledge
- Providing automatic features for governance, compliance, long-term retention, high availability
- Main system types
  - Document Management Systems (DMS)
  - Content Management Systems (CMS)
  - Portal Systems

CMS vs. DMS

Document Management System (DMS)
- Central storage and coordinated access to weakly structured information and documents
- Management of meta information for document classification
- Access control (rights management, check-in / check out)
- Support of compliance requirements

Content management systems (CMS)
- Quality ensuring for publication and creation of content
- Content and layout managed separately
- Publications are composed dynamically from basic data when being released
- Strict role separation between producers (authors) and content consumers (users)

Support of KM activities
- Simple creation and preservation of knowledge
- Spread knowledge

Portal Systems

- Uniform, structured access to information (single sign-on)
- Integration of different basic systems like databases, CMS, DMS, groupware, ERP … with one common front end (= "Portal")
- Personalization
- User profiles
- Offer relevant information for users
- Front end is adaptable to user needs (portlets, e.g. for searching)
- Secure access (authentication, authorization) from different locations with different devices

Support of KM activities
- Knowledge portals for creating, development and spread of knowledge
- Dependent on the integration level, KM is supported more or less completely

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Artificial Intelligence (AI) Systems

Artificial intelligence (AI) is a technology and a branch of computer science that studies and develops intelligent machines and software.

Several types of an AI system can be distinguished
- Systems that think like humans
- Systems that act like humans
- Systems that act rationally

Artificial intelligence = Systems reproducing the human intelligence
- Expert systems / knowledge based systems
- Agent- and notification systems

Support of KM activities
- Knowledge generation (advisory systems, data mining)
- Automatic message delivery / Search tasks (spread knowledge)
- Knowledge identification (text analysis)
- Knowledge representation (OLAP)

Executive Information Systems

An executive information system (EIS) is a decision support system (DSS) used to assist senior executives in the decision-making process.

Executive information systems can be used in many different types of organizations to monitor enterprise performance as well as to identify opportunities and problems.

Executive information systems = Collection, processing, aggregating of information for management needs

- Data mining systems
- OLAP, Data Warehouse

Other systems: Search Services and Information Support

Pull systems:
- Lookup one or more indices based on a query
- Usage of search terms, Boolean operators, natural language for queries

Push systems:
- Relevant data is delivered when available if it fits to the users profile
- Search agents, subscriptions, newsgroups, list servers
- User profile contains topics of interest, languages, data format, etc.

Usage in KM
- Find knowledge
- Find experts and knowledge carriers

Other systems: Information Visualization

- "The use of computer-supported, interactive, visual representations of abstract data to amplify cognition." (Card et al. 1999)

- "… to bring to light meanings in data that might remain hidden from view if displayed in other ways." (Few, 2008, S. 15).

Purpose:

- Presentation of an abstract phenomenon like social relationships, relations between documents, trends in economical data

- Analysis and exploration of huge (distributed) data stocks in order to discover and understand patters, relations and trends

- Support the search and navigation through document stocks

Information Visualization – Example Knowledge Landscape

- Clustering and rendering of the document stock with the help of the map metaphor

- E.g. news articles

- Mountains / clusters: many similar documents for a keyword

- Valleys = less / no documents available

- Distance = more similar documents are placed closer

- Dots = concrete document

- Blue circles = search results
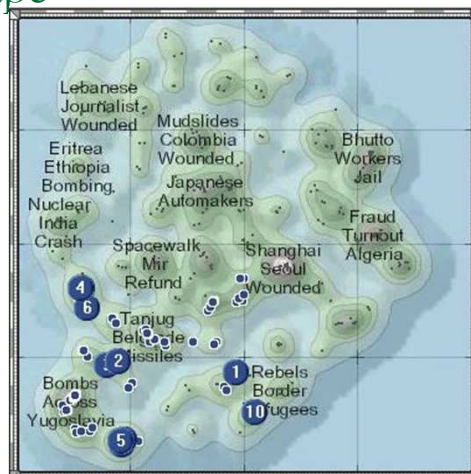
Source: Dürsteler, 1999, www.infovis.net/

(3) Knowledge Management systems (KMS)

Knowledge Management System
Definition

„*A knowledge management system (KMS) is an ICT system in the sense of an application system or an ICT platform that combines and integrates functions for the contextualized handling of both, explicit and tacit knowledge, throughout the organization or that part of the organization that is targeted by a KM initiative. A KMS supports networks of knowledge workers in the creation, construction, identification, capturing, acquisition, selection, valuation, organization, linking, structuring, formalization, visualization, distribution, retention, maintenance, refinement, evolution, accessing, search and last but not least the application of knowledge the aim of which is to support the dynamics of organizational learning and organizational effectiveness.*"*

(Maier 2002)

KM & Information Technologies

The challenge is to identify and integrate the following three technologies:

- ➢ **Communication technologies** allow users to access needed knowledge, and to communicate with each other-- especially with experts.

- ➢ **Collaboration technologies** provide the means to perform group work.

- ➢ **Storage technologies** use a database management system to capture, store and manage knowledge.

Definition

A knowledge management system (KMS) is a software system, that offers functionality supporting

- identification,
- acquisition,
- development,
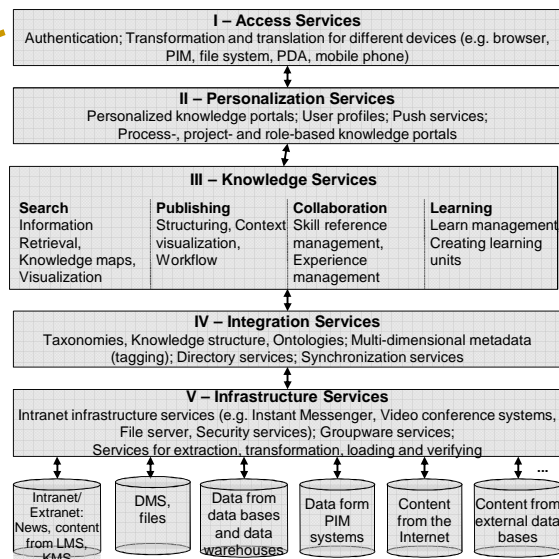- spreading,
- preservation and
- rating

of knowledge (information and context) with the goal of supporting organizational learning and efficiency.

KMS functionality

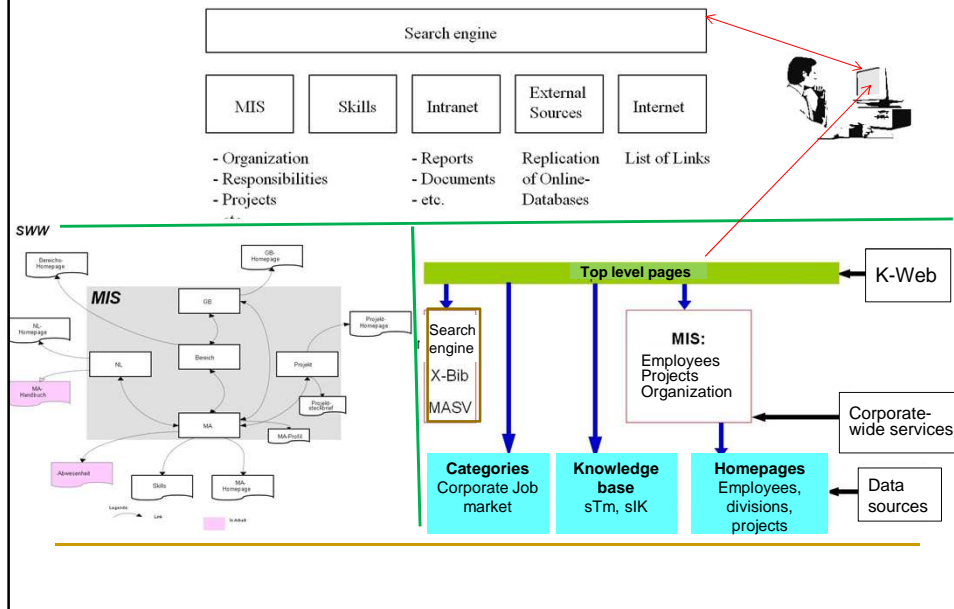Complete KMS typically support the following functions:

- Knowledge search (pull)
- Knowledge delivery (push)
- Knowledge representation and visualization
- Knowledge publication, structuring and linking
- Knowledge communication and cooperation
- KMS administration and organization respective knowledge base management
- Data analysis for creating knowledge elements
- Supporting computer based lecturing and learning
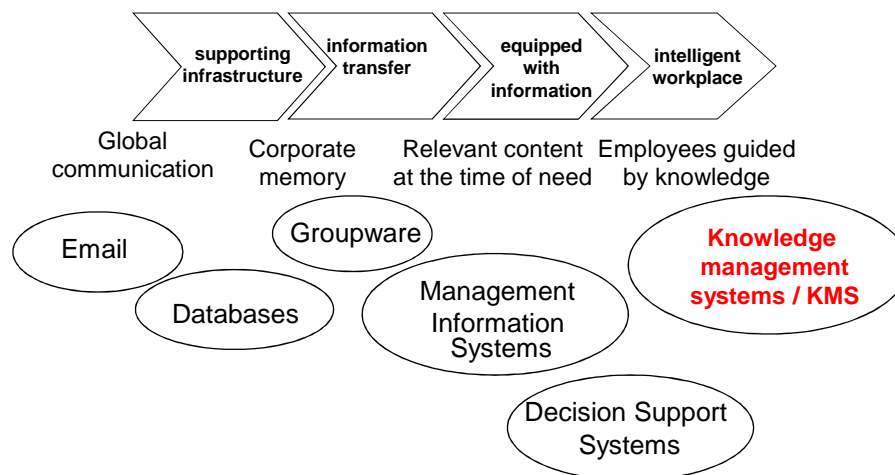
Centralized KMS architecture

I – Access Services
Authentication; Transformation and translation for different devices (e.g. browser, PIM, file system, PDA, mobile phone)

II – Personalization Services
Personalized knowledge portals; User profiles; Push services; Process-, project- and role-based knowledge portals

III – Knowledge Services

Search	Publishing	Collaboration	Learning
Information Retrieval, Knowledge maps, Visualization	Structuring, Context visualization, Workflow	Skill reference management, Experience management	Learn management, Creating learning units

IV – Integration Services
Taxonomies, Knowledge structure, Ontologies; Multi-dimensional metadata (tagging); Directory services; Synchronization services

V – Infrastructure Services
Intranet infrastructure services (e.g. Instant Messenger, Video conference systems, File server, Security services); Groupware services; Services for extraction, transformation, loading and verifying

Intranet/ Extranet: News, content from LMS, KMS | DMS, files | Data from data bases and data warehouses | Data form PIM systems | Content from the Internet | Content from external data bases

Source: Maier, 2004

KMS architecture – Example SD&M

Evolution of KMS

(4) Knowledge Engineering

Definition of Knowledge Engineering

- Knowledge Engineering is the process used to acquire and structure information about a subject. This approach serves to guide development of the integrated knowledge base required for problem solving and decision making and identify deficiencies in the knowledge base needed for planning new research

- Knowledge Engineering (KE) is a field within Artificial Intelligence that develops Knowledge Based Systems

(source MOCURIS)

Applying Knowledge Engineering

- **Knowledge Acquisition**
  - Generation
  - Preservation
  - Exploration
  - Interpretation
- **Knowledge Elicitation**
  - Make process in the human brain transparent
  - Transfer experts knowledge to create tangible asset
- **Knowledge Representation**
  - Providing of theories and systems for expressing structured knowledge and for accessing and reasoning with it in a principled way.

Contrasting Knowledge Management and Knowledge Engineering

Knowledge Management	Knowledge Engineering
Information Systems and Management	**Computer Science**
Development of organizational software and technical systems for enabling knowledge processes in organizations	**Development of Artificial Intelligence or Knowledge-based Systems**
Whole spectrum from Tacit to Explicit Knowledge	**Problem Solving, mainly Explicit Knowledge**

(source MOCURIS)

(5) Examples

- Yellow Pages

- Mind Mapping Tools

Yellow Pages

... as practical realization of knowledge source and asset maps

- Goal: allow direct contact to the persons with the required knowledge

  - Make existing knowledge for a specific area available for all organization members
  - Register employees with special knowledge independent from their position within the organization
  - Encourage a learn- and exchange process within an organization

Yellow Pages – continued

- Capturing and structuring of employee profiles
- Personal profile:
    - Name, affiliation to organizational unit, contact data
    - Current activity
    - Education, qualifications, training, certifications
    - Expertise
    - Method competences (e.g. project leadership, time management, …)
    - Social competences (e.g. ability to work in a team, leading, …)
    - Experiential knowledge (e.g. by project work, branch expertise …)
    - Foreign languages
    - Hobbies / interests

Yellow Pages
Example: Continental AG, Hannover

- Continental AG is the worldwide leading automobile industry supplier
- Currently about 72.000 employees at more then100 locations worldwide
- Due to the lack of central personal development no overview of the competences of all employees

Goals:
- Make the employees knowledge transparent in the whole company and use synergies between the different divisions
- Ease up arranging new project teams

Yellow Pages

Example: Continental AG, Hannover

(Source: altavier.de – Yellow Pages at Continental AG, Hannover)
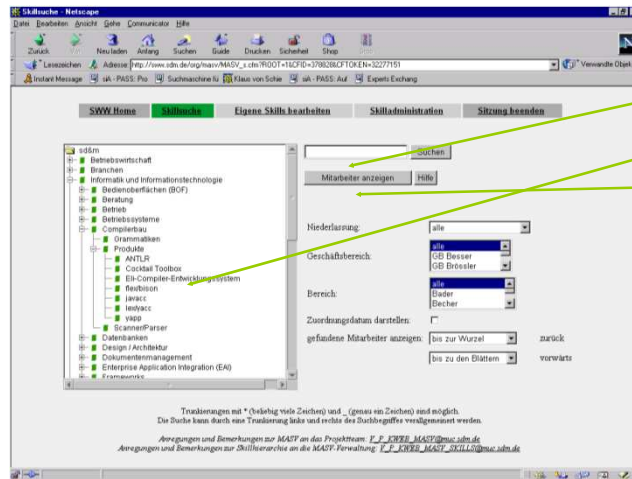
Yellow Pages

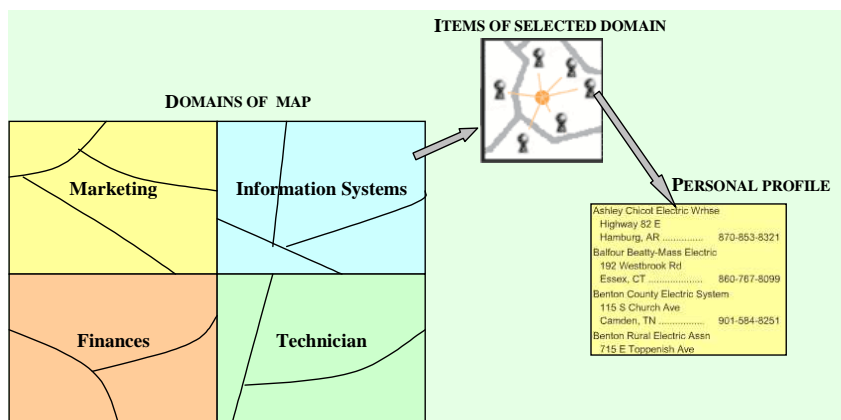Example: sd&m Knowledge-Web – employee skill management
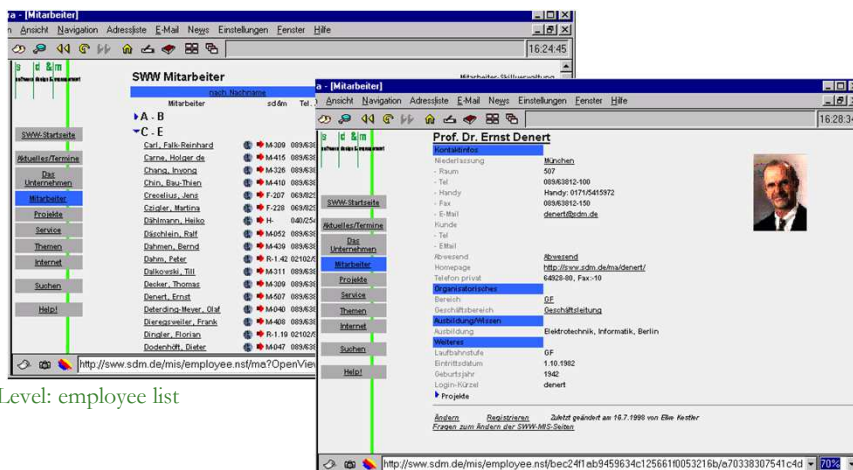
Top-Level: employee list

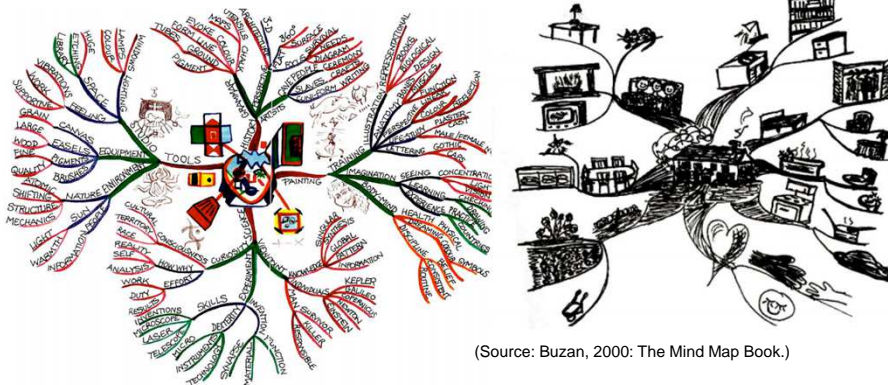# Yellow Pages

Example: sd&m Knowledge-Web – employee search

- search for term
- Click skill
- View employee

Yellow Pages and Knowledge Maps

ITEMS OF SELECTED DOMAIN

DOMAINS OF MAP

Marketing

Information Systems

Finances

Technician

PERSONAL PROFILE

Ashley Chicot Electric Wrhse
Highway 52 E
Hamburg, AR 870-853-8321
Balfour Beatty-Mass Electric
192 Westbrook Rd
Essex, CT 860-767-8099
Benton County Electric System
115 S Church Ave
Camden, TN 901-584-8251
Benton Rural Electric Assn
715 E Toppenish Ave

(adapted from MOCURIS)

Mind Maps

(Source: Buzan, 2000: The Mind Map Book.)

Visualizing the knowledge structure (e.g. company knowledge) with it's relations, associations and dependencies

Creating mind maps

- **1. Step: Write down the central topic**
  A mind map is always started by writing down the central topic in the middle of a paper.

- **2. Step: Collect key words**
  Collect as many words as you can think of to the topic

- **3. Step: Find generic terms and associate key words**
  In order to organize the topic, find general terms and associate your key words below them.

- **4. Step: Refine and extend mind map**

Mind mapping tools

Examples for free tools:

- Freemind
- Xmind
- Bubbl.US
- MindMeister
- Map Myself (aka Mapul)
- Wisemapping

For more tools visit:

http://en.wikipedia.org/wiki/List_of_concept-_and_mind-mapping_software
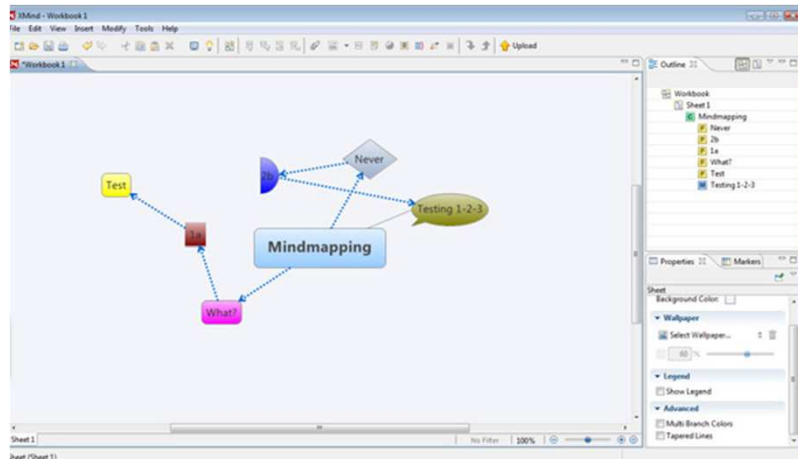
Example: Freemind

http://freemind.softonic.de/
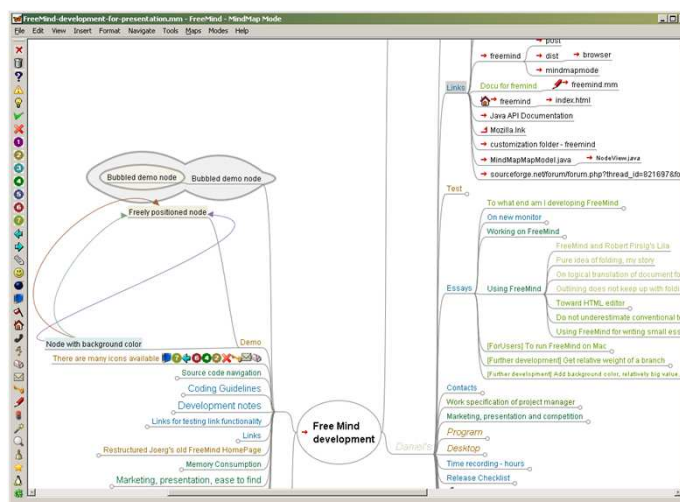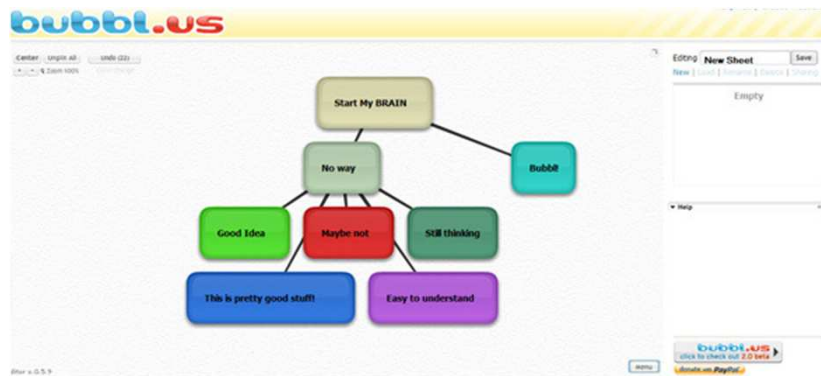
Freemind: Program documentation
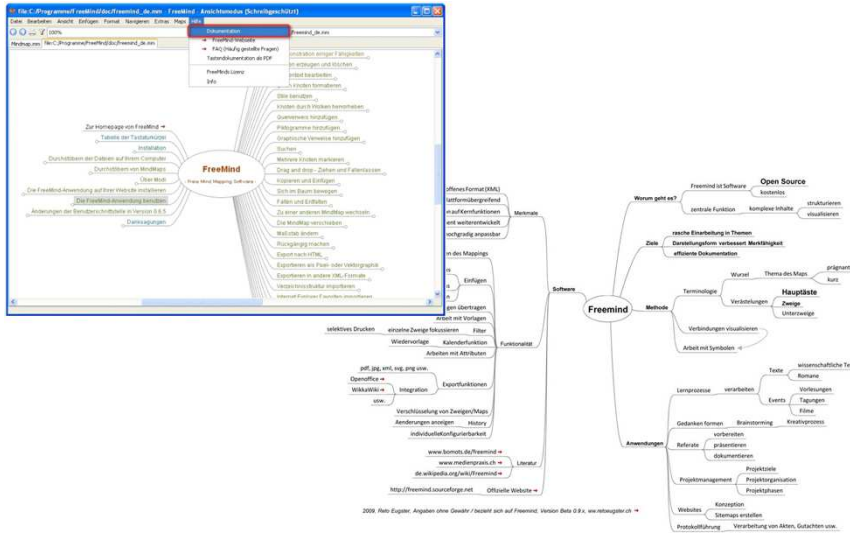
Example: Xmind

*www.**xmind**.net*

Example: Bubbl.US

www.bubbl.us

Example: MindMeister
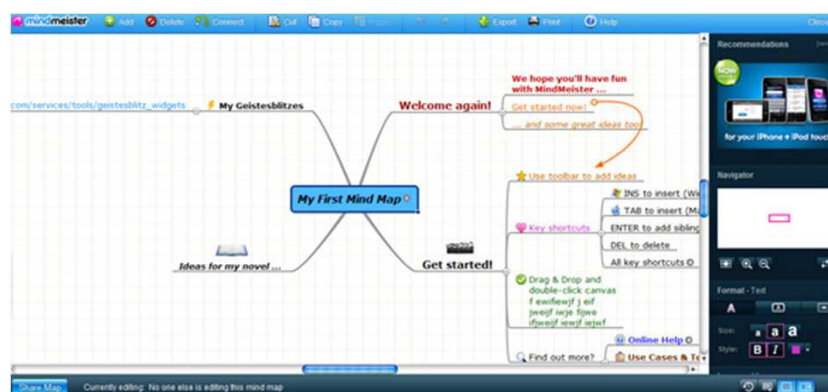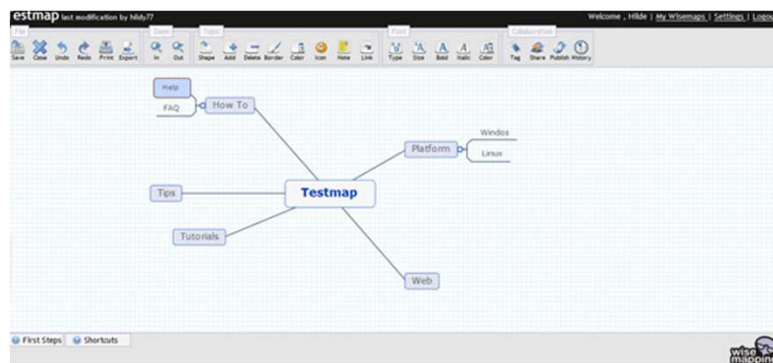

*www.**mindmeister**.com*

Example: Map Myself
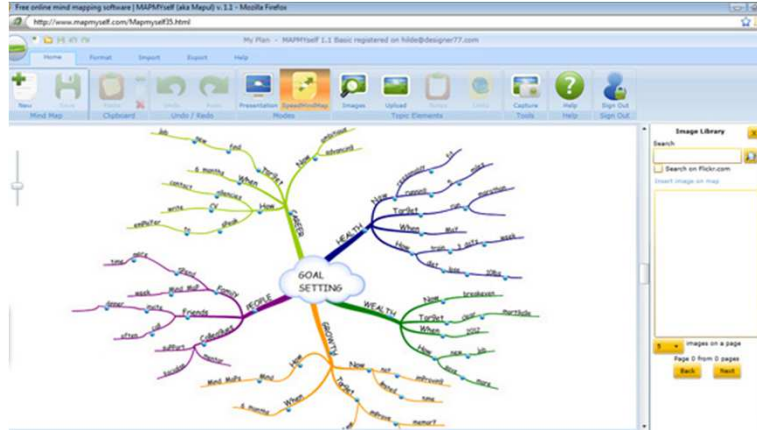
*www.**mapul**.com*, *mapmyself.com/*

Example: Wisemapping

*www.**wisemapping**.org*

Summary - Myths of Knowledge Management

- **Myth 1:**
  KM technologies can deliver the right information to the right person at the right time

- **Myth 2:**
  KM technologies can „store" human knowledge, intelligence or experience

- **Myth 3:**
  KM technologies can distribute or multiply human intelligence

Recommended readings

- Young, R. (Ed.): Knowledge Management Tools and Techniques Manual. Asian Productivity Organization,Tokyo 2010
- Hackbarth, G. (1998). The Impact of Organizational Memory on IT Systems, In Proceedings of the Fourth Americase Conference on Information Systems, E. Hoadley and I. Benbasat (eds)., pp. 588-590.
- Maier, R.: Knowledge Management Systems. Springer, 2004.
- Knowledge and Knowledge Representation: A. Abecker and L. van Elst, Ontologies for Knowledge Management, in Handbook on Ontologies second edition, International handbooks on information systems, Heidelberg: Springer, 2009, pp. 713-734.
- Tools and Social Software: ZHENG Y, LI L and ZHENG F (2010) Social Media Support for Knowledge Management. In Proceedings of the International Conference on Management and Service Science. pp 1-4, IEEE
- Tiwana A. The Knowledge Management Toolkit, Prentice-Hall, New Jersey, 2000.
- Berghoff U.M. and Pareshi R. (Eds.). Information Technology for Knowledge Management, Springer-Verlag, Berlin, 1998