AALBORG UNIVERSITY

Building Informatics

IKT og Videnrepræsentationer -
ICT and Knowledge Representations.

11. Knowledge management in practice

Cand. Scient. Bygningsinformatik.
Semester 2, 2010.

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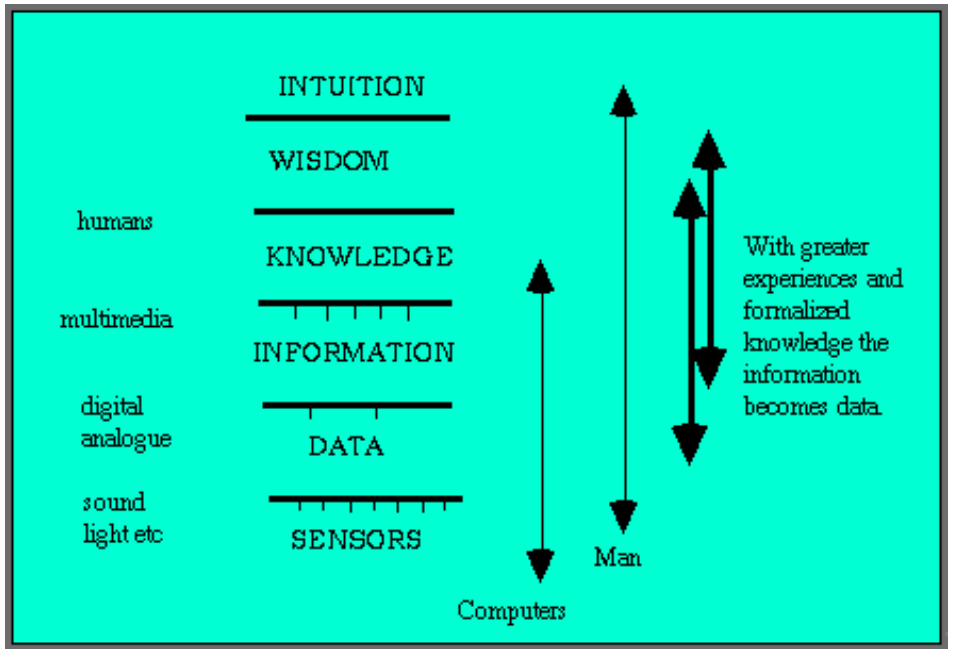
Data Information Knowledge

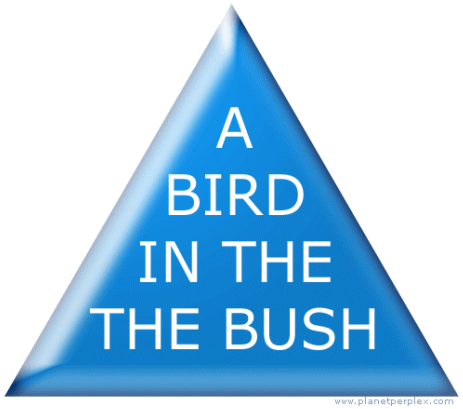


The abstraction hierarchy of knowledge. Knowledge has a limited duration in time. (The world is not flat any longer).

From Christiansson, P, "The Formalization process in Global Knowledge Handling". Research Directions for Artificial Intelligence in Design. (eds) J.S. Gero and F. Sudweeks. Key Centre of Design Computing, University of Sydney.(the Fourth Workshop on Research Directions for Artificial Intelligence in Design. University of Twente. Enschede, The Netherlands. January 6 1995). (pp 23-34).(Invited position paper)

Olny srmat poelpe can raed tihs.
I cdnuolt blveiee taht I cluod aulaclty uesdnatnrd waht I was rdanieg. The phaonmneal pweor of the hmuan mnid, aoccdrnig to a rscheearch at Cmabrigde Uinervtisy, it deosn't mttaer in waht oredr the ltteers in a wrod are, the olny iprmoatnt tihng is taht the frist and lsat ltteer be in the rghit pclae. The rset can be a taotl mses and you can sitll raed it wouthit a porbelm.. Tihs is bcuseae the huamn mnid deos not raed ervey lteter by istlef, but the wrod as a wlohe. Amzanig huh? yaeh and I awlyas tghuhot slpeling was ipmorantt! if you can raed tihs psas it on !!

Read this aloud:



KM Paradigm

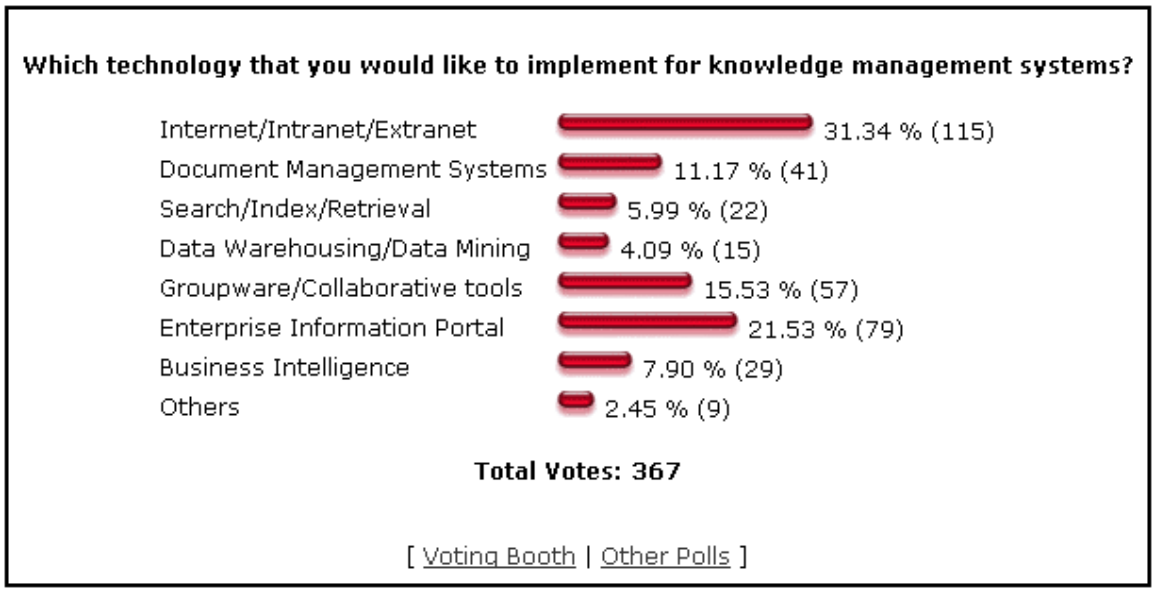
Paradigm [Merriam-Webster's Collegiate Dictionary]

" a philosophical and theoretical framework of a scientific school or discipline within which theories, laws, and generalizations and the experiments performed in support of them are formulated"

What will characterize the KM paradigm?

- *Ownership* of digitally stored knowledge will be more in focus
- Wish to share *knowledge* (also give away)
- Better utilization of *personal knowledge*
- Adapted (distributed) personal and group *learning*
- Project *memory* (short and long term)
- *Dynamically networked* information containers
- High *information accessibility* (adapted, meta containers/recipies, everywhere, any time, filtered access)
- Broad spectrum of *projects* with regard to size and duration
- More *'intelligence'* in the information systems (agents, avatars, reasoning and interpretation capabilities, ontologies)

KM Technology

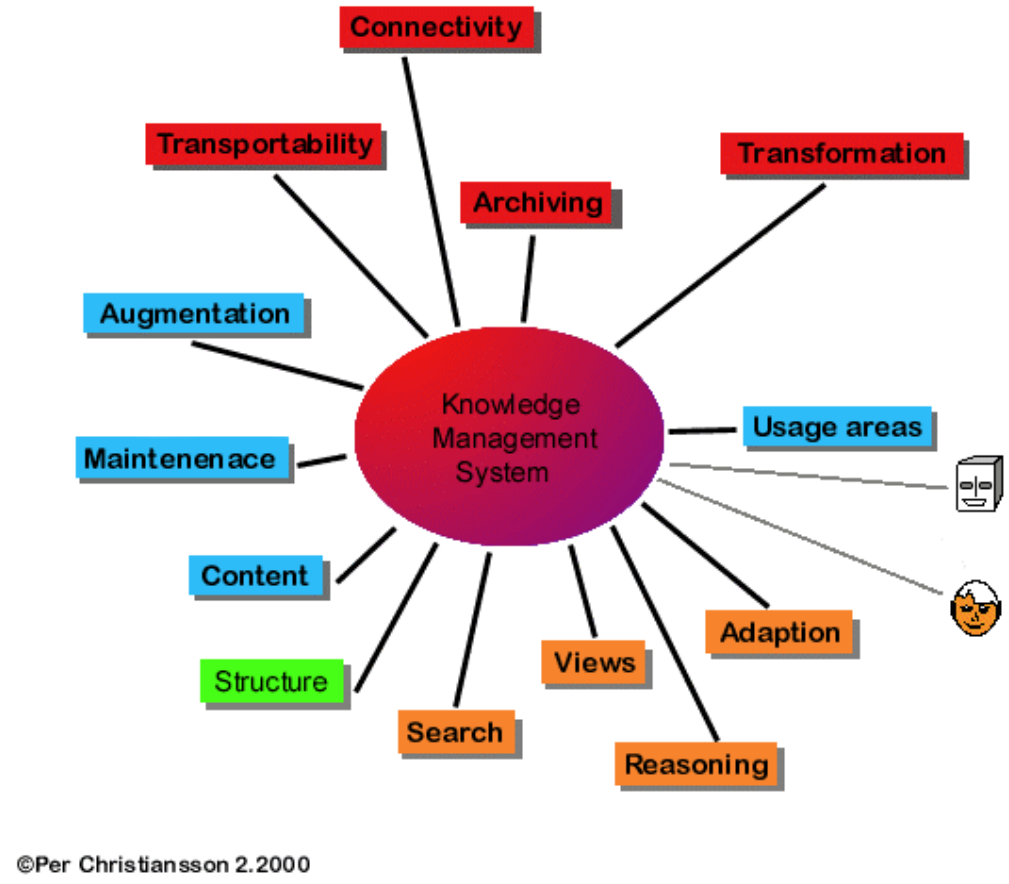


rom MetaKM, http://www.metakm.com/ , 'The knowledge management portal for practitioners, researchers, and solution providers.' 2002. (NOT ACTIVE AN LONGER)

ICT tools have to be modified and new tools have to be defined, designed and implemented and tuned

- knowledge capture tools
- storage tools
- tools for knowledge abstraction and generalisation
- reasoning tools
- knowledge communication tools
- knowledge delivery tools
- knowledge discovery tools

KM Systems



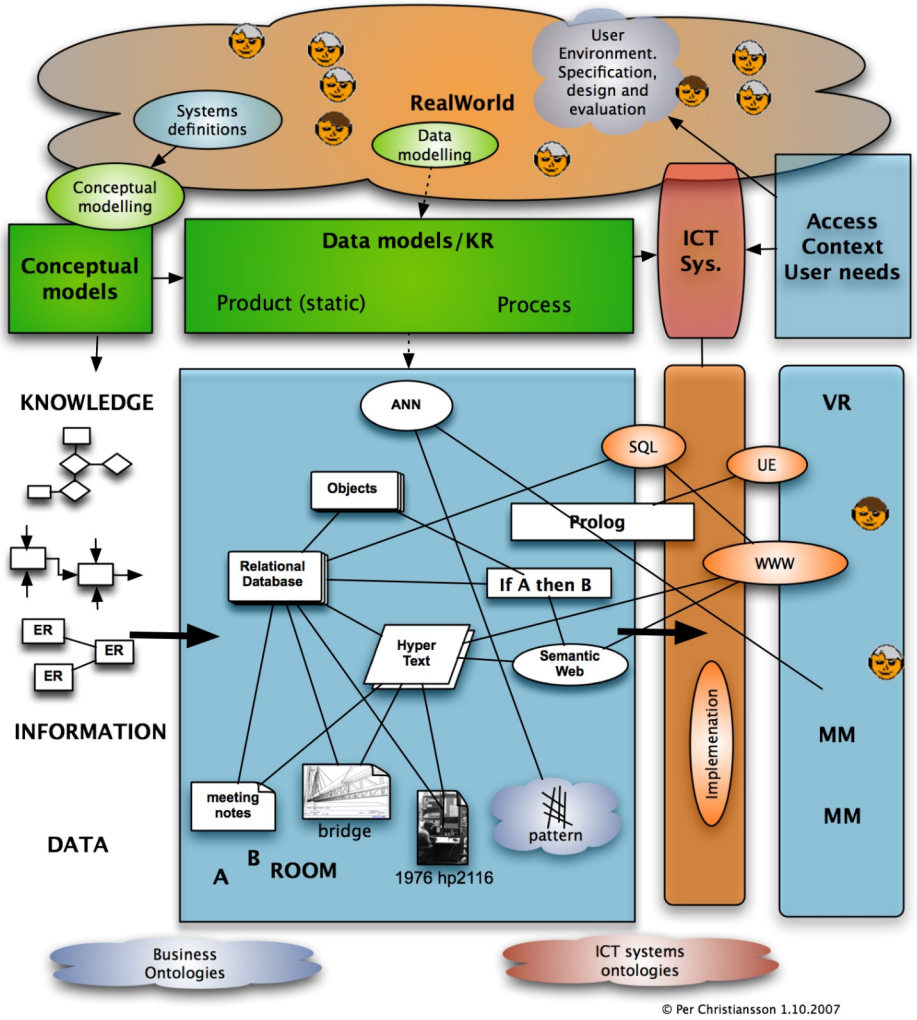
Knowledge Management, KM, systems have to fulfill a number of requirements from use, administration and flexibility to change. (See also http://www.knowledgeboard.com/,……)

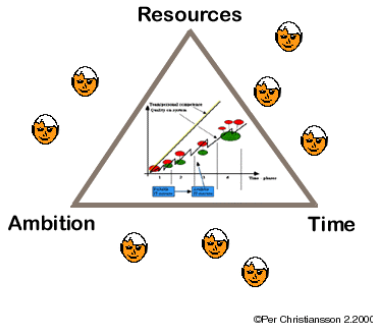
KM Models

As knowledge to higher degree than before becomes digitally stored the demand for formalised descriptions (models) increases

- organisation process and project models
- product models
- production system models
- user models (personal and team)
- new types of services and applications models
- ICT tools models

SYSTEM DEVELOPMENT

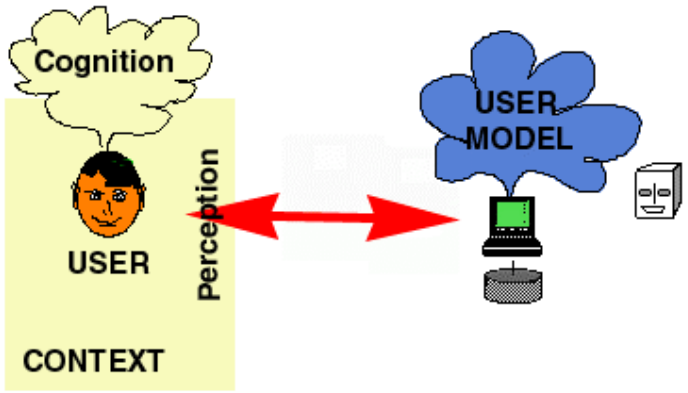




Always achieve a good balance between Time, Ambition and Resources.

From the real world to implemented systems in use

USER MODELS



The computer contains a more or less explicitely described user model.

Merriam Webster:

Cognition = the act or process of knowing including both awareness and judgement;
from co- + gnoscere to come to know

Perception = act of perceiving; awareness of the elements of environment through physical sensation (Percieving = to become aware of through the senses)

From Christiansson P, Lagerstedt R, Engborg U, 1996, "User Models in Search and Navigation Systems on the Internet". AEC Applications of the Internet" AEC Systems Anaheim June 17-20. (7 pp).

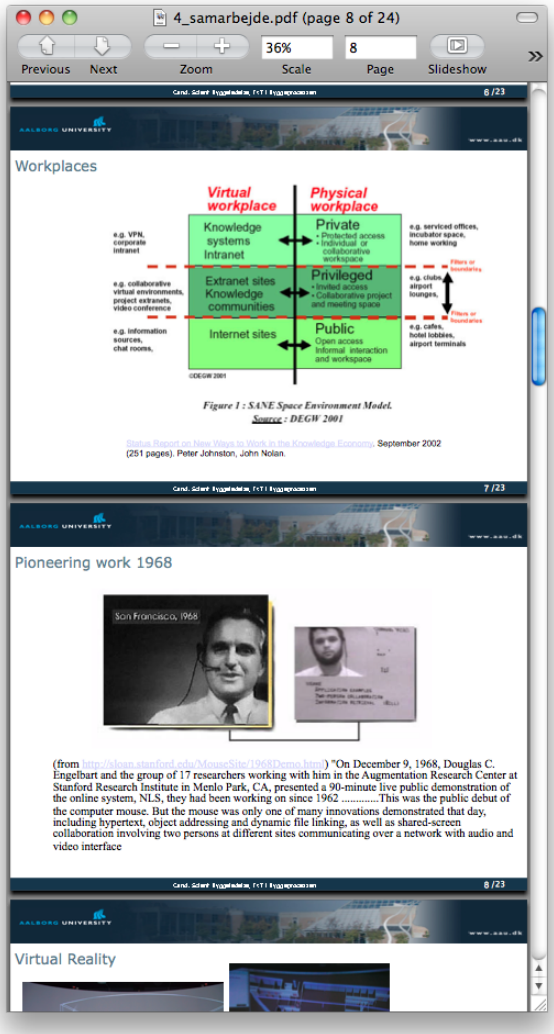
User models stereotypes were defined, user competence, usage profiles,

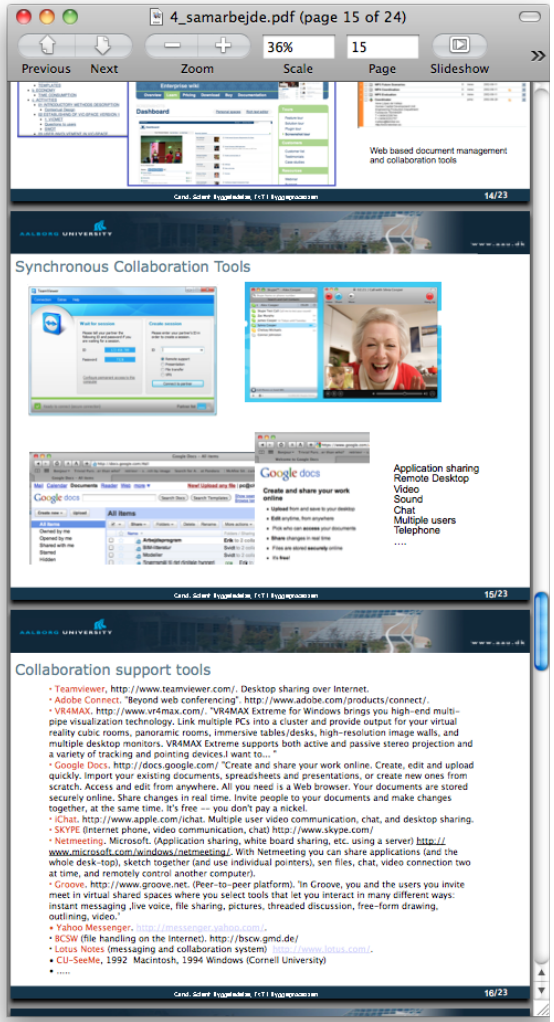
- what is your education pointed at (Project Manager, Civil Engineer,..)
- what is your primary task (user, developer, administrator, ..)
- what subjects do you have knowledge or interest in?

Gardners Multiple Intelligences From (funderstanding - Gardner, http://www.funderstanding.com/learning_theory_how7.html)

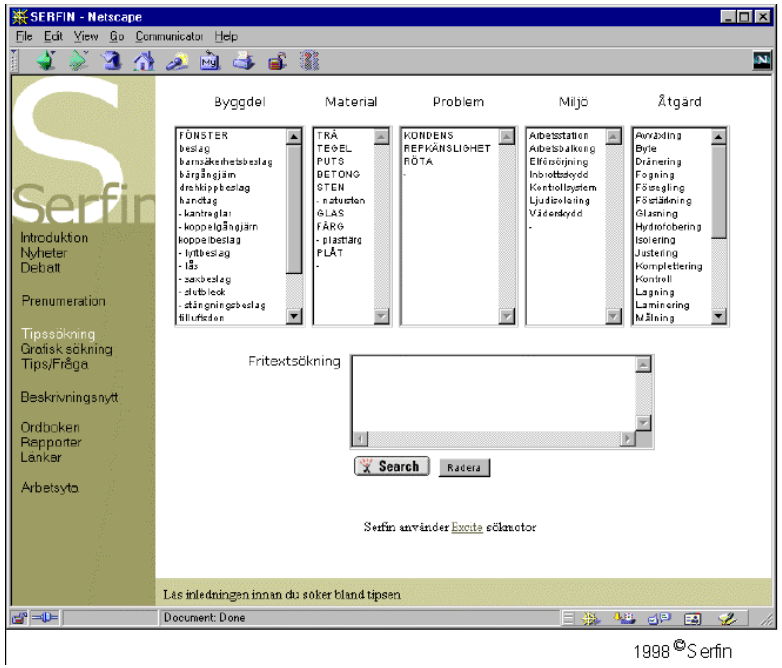
1. *Verbal-Linguistic*--The ability to use words and language
2. *Logical-Mathematical*--The capacity for inductive and deductive thinking and reasoning, as well as the use of numbers and the recognition of abstract patterns
3. *Visual-Spatial*--The ability to visualize objects and spatial dimensions, and create internal images and pictures
4. *Body-Kinesthetic*--The wisdom of the body and the ability to control physical motion
5. *Musical-Rhythmic*--The ability to recognize tonal patterns and sounds, as well as a sensitivity to rhythms and beats
6. *Interpersonal*--The capacity for person-to-person communications and relationships
7. *Intrapersonal*--The spiritual, inner states of being, self-reflection, and awareness

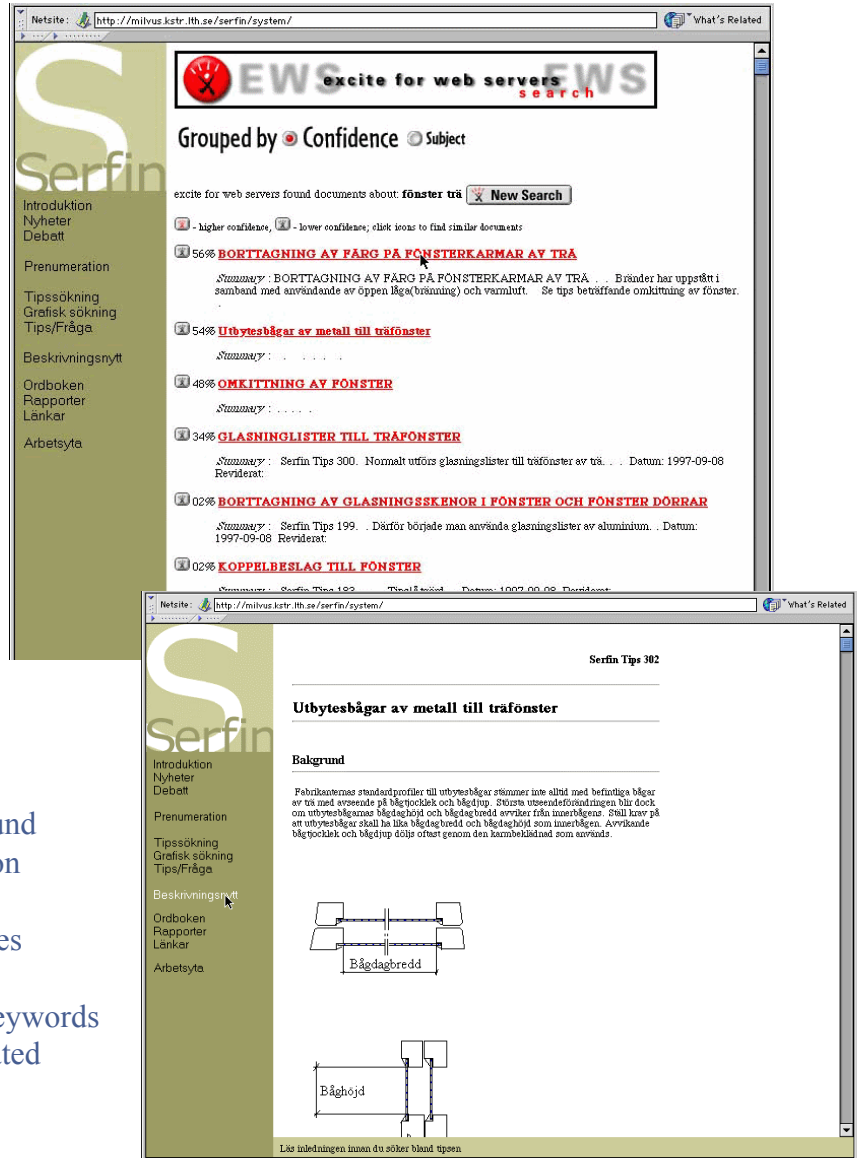
RECAP from Semester 1 2010 course 'IKT i projektering og udførelse/ICT Fundamentals in Construction'





The SERFIN example





Christiansson P, et.al. 1999, " SERFIN2 - Skadeförebyggande Erfarenhetsåterföring för Fastighetsförvaltare på Internet. /Building Maintenance Experience Communication on the Internet". (pdf-version). Swedish Council for Building Research and KBS-Media Lab, Lunds Universitet. (105 pp.)

Title
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Tip/Action
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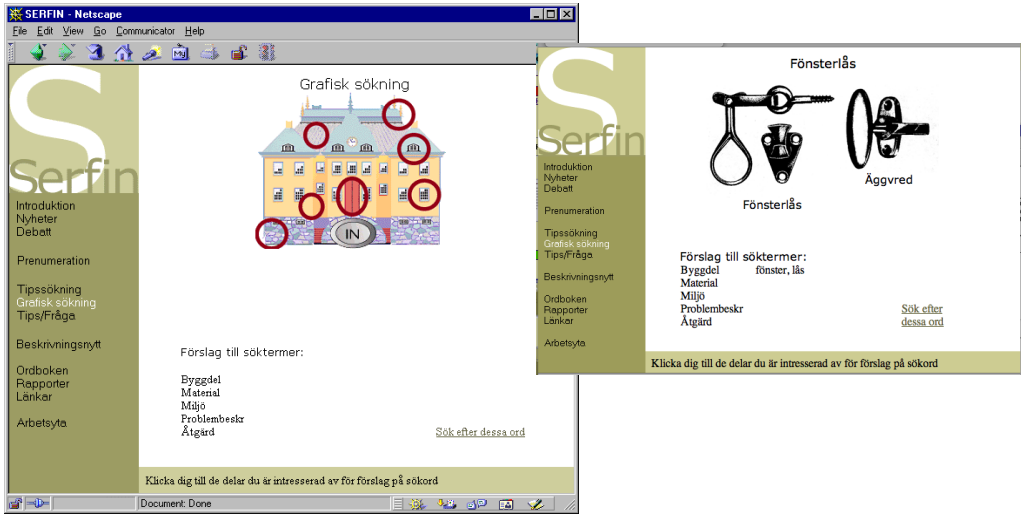
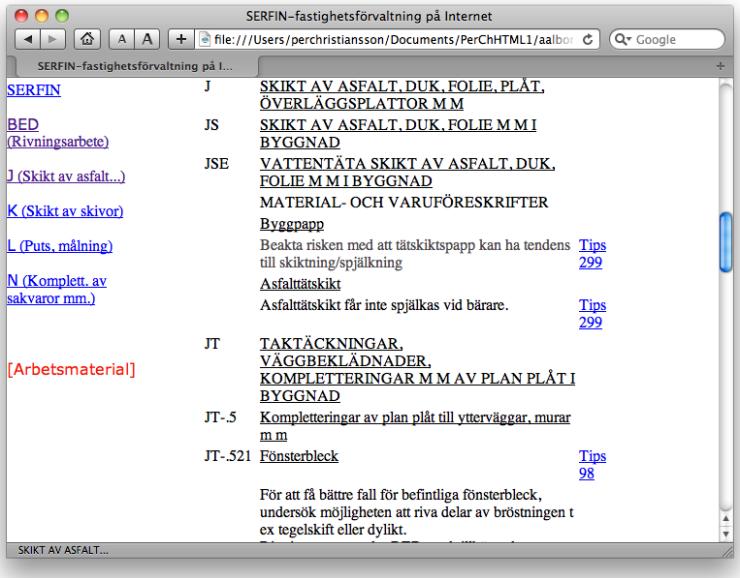
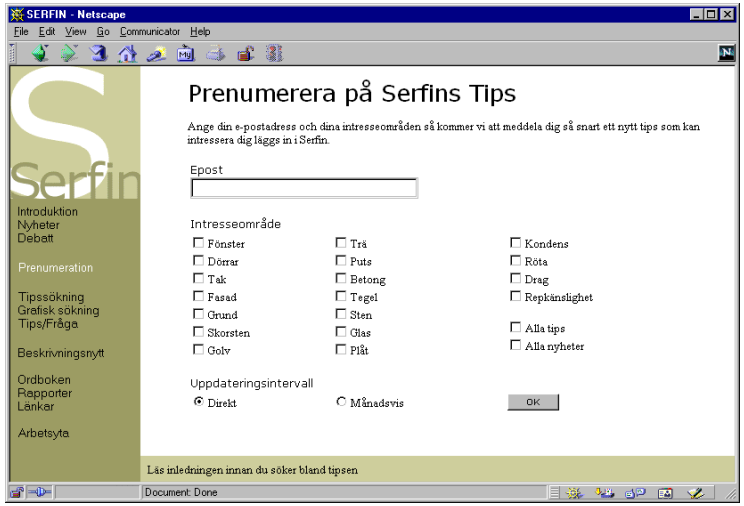
References
Code
Search keywords
Date created
Revised

The SERFIN example







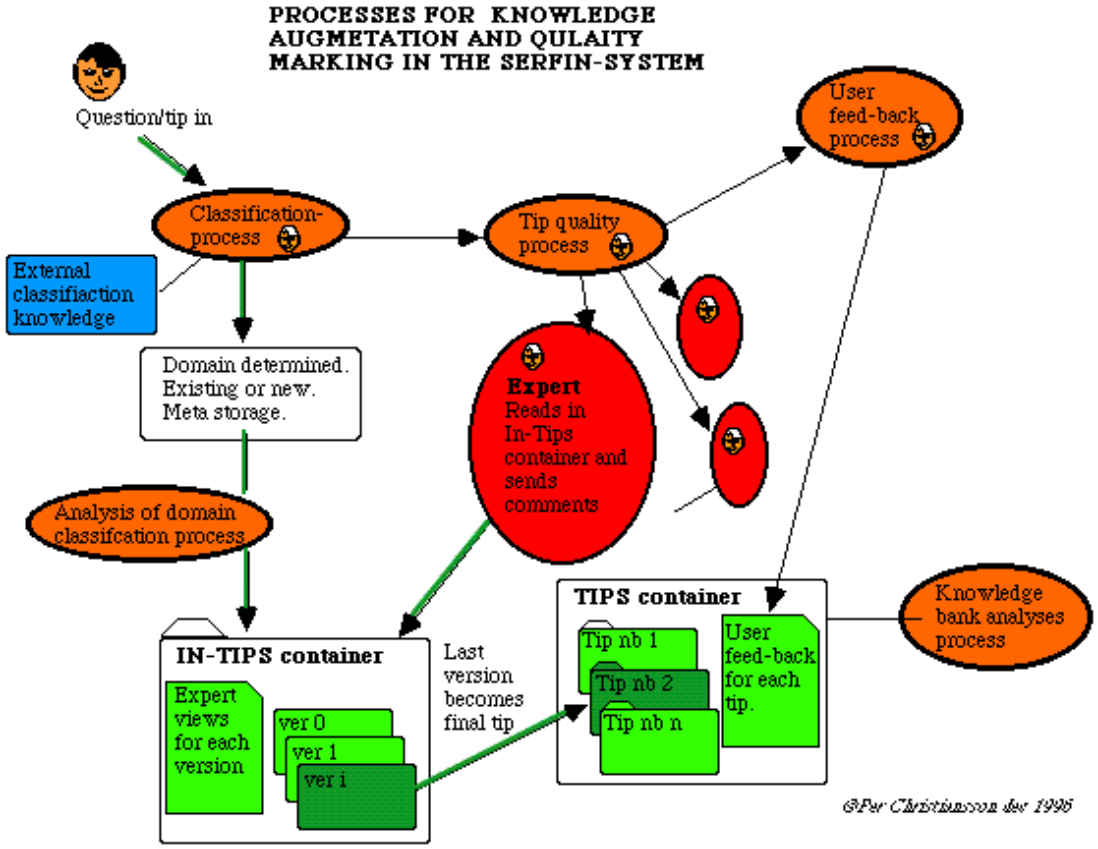
"Beskrivningsnytt från förvaltare" är ett exempel på praktisk tillämpning av de tips som utarbetats i BFR:projektet Serfin "Skadeförebyggande erfarenhetsåterföring - förvaltning".

Innehållet i Serfin är framtaget med ledning av erfarenheter från fastighetsförvaltningen och utarbetats i samarbete med representanter för Akademiska Hus, Vasakronan AB, Hantverks- och industribyggen i Stockholm (HIBY), Postfastigheter, Statens Fastighetsverk, Familjebostäder, Skandia Fastigheter.

"Beskrivningsnytt från förvaltare" vänder sig till alla dem som arbetar inom projekterings-, upphandlings-, produktions- och förvaltningsskedena.

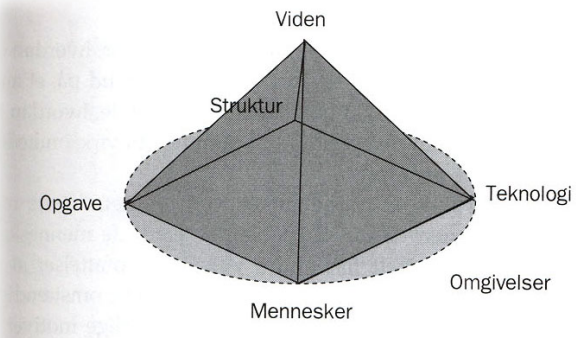
Texterna knyter an till HusAMA 98 med råd och anvisningar men återfinns inte där.

The SERFIN process



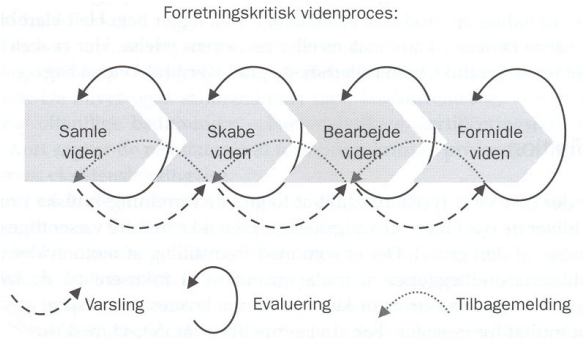
- Information quality assurance process
- Tips are stored in versions on a WWW intranet
- Specialists groups annotate documents using Acrobate Exchange

Videnledelse i praksis



Figur 2.2: Pyramiden symboliserer hvordan videnprocesserne er en del af de organisatoriske dynamikker

1. Viden+ledelse = videnledelse? (s17)
2. Virksomheden som et system af videnprocesser (s27)
3. Når viden bliver levende - de forretningskritiske videnprocesser (s39)
4. (Videnmedarbejdere har også brug for ledelse) (s63)
5. Kommunikation og videndeling - at tale ordentligt om det væsentlige (s89)
6. Komptenceudvikling - et personligt projekt (s115)
7. Innovation - viden bliver hurtigt forældet (s143)
8. Optimering af videnprocesser - den korteste vej mellem to punkter (s169)
9. Hvis nu man arbejder med og ikke imod naturen - incitamenter og barrierer (s193)
10. Målinger - kan man sætte tal på det uhåndgripelige (s215)
11. Internet og intranet for ikke-entusiaster (s237)
12. Lugten i bageriet - kultur i videnorganisationer (s253)



Figur 3.1: Videnprocesserne udgør en vekselvirkning mellem faserne at *samle*, *skabe*, *bearbejde* og *formidle* viden på den ene side og løbende varslinger, evalueringer og tilbagemeldinger på den anden

"Varsling er virksomhedens metoder til at overvåge og indsamle viden - fra tilfældig avislæsning til sofistikerede CRM systemer." s. 147

Videnledelse i praksis

Praksisfællesskaber
Det typiske praksisfællesskab er kendetegnet ved:

- En *fælles, bred interesse* for et eller andet, som f.eks. bestemte behandlingsformer, programmeringssprog og teknologier
- Et *fællesskab*, hvor individerne mødes og knytter sig til hinanden på kryds og tværs, som f.eks. til internationale gigant-kongresser, hvor man nemt kan blive væk, i mindre grupper på fælles projekter osv.
- En *fælles praksis*, en klar oplevelse af at bidrage til gavn for et eller andet konkret mål og til gavn for medlemmerne. Gratis hjælp, når man skal løse konkrete opgaver er ikke dårligt.

Praksisfællesskaber kan udvikles inden for virksomheden alene eller kan udbredes til at omfatte virksomheden og dens kunder/brugere, leverandører osv. Eller praksisfællesskabet kan eksistere på tværs af virksomhederne eller helt uden for dem.

Praksisfællesskaber bidrager til virksomhedens evne til videndeling, både med omverdenen og internt. For at få gavn af dette, er det nødvendigt at forstå de særegne træk ved praksisfællesskabet i modsætning til andre organisationsformer. Skemaet her sammenligner praksisfællesskabet som organisationsform med den etablerede organisation, afdelingen og med den midlertidige, projektgruppen.

Organisation	Afdeling	Praksisfællesskab	Projektgruppe
Mål	Bredt, stabilt	Vagt, mere interesse end mål	Kortsigtet, konkret
Varighed	Så længe organisationen består	Så længe der er aktivitet, dvs. interesse	Afsluttes når opgaven er løst
Kommunikation	Fastlagt gennem procedurer og sædvaner	Åben, mangfoldig, sædvanebetonet	Etableret til lejligheden. Fokus på opgaveløsningen
Ledelse	Etableret, en del af organisationen og dermed med fast ledelsesstruktur	Ingen ledelse, men »ildsjæle« Uden for ledelsens rækkevidde	Udpeget projektleder mens projektet foregår Styring via styregruppe eller projektejer
Produkt	Stabile leverancer af fastlagte ydelser	Konkrete løsninger, fællesskab, videndeling	Konkret løsning af specifik opgave
Kompetencer	Baseres på job- og uddannelsesstrukturer Udvikles over lang tid og i formaliserede rammer	Interessebaseret på tværs af formelle fag. Gensidig udvikling baseres på individuelt engagement	Sammensætning af projektgruppe afspejler behov for kompetencer. Kompetencer udvikles uden for projektet
Tid og sted	Inden for fastlagte rammer – både hvad angår tid og sted	Virtuelt i både tid og sted Frivilligt	Uden for organisationens normale rum, men med klare aftaler om tid og sted

Praksisfællesskaber kan specielt bidrage til virksomheden på tre forskellige måder:

- Skabe løsninger på tværs af normale organisatoriske grænser
- Forvalte og udvikle viden som er kritisk for virksomheden
- Understøtte fælles faglighed og identitet.

More to read:
Wenger E, Etienne Wengers homepage, http://www.ewenger.com/

Videnledelse i praksis

Faglige kompetencer	»Min unikke viden ... «
Personlige kompetencer	»Min måde at fungere på ... «
Sociale kompetencer	»Vores sociale samspil ... «
Systemkompetencer	»Måden vi gør tingene på her ... «
Helhedskompetencer	»Vores overordnede opgave ... «

Tabel 6.1: Videnmedarbejderen skal udvikle sine kompetencer på alle 5 områder

	Værdiskabelse **Krav »udefra«**	**Ambitioner** **Ønsker »indefra«**
På kort sigt	Løs opgaven Lær det fornødne **Træning**	Vælg spændende opgaver Undersøg mulighederne **Opdagelse**
På langt sigt	Stå til rådighed Test egen formåen **Afprøvning**	Skab et fagligt project Udvikl det til et »professorat« **Studium**

Figur 6.2: Fire tilgange til kompetenceudviklingen

Fase	**Indsats**
Videnindsamling	• Brug af eksisterende dokumentation • Automatisk dataopsamling • Opsamling af individuelle erfaringer
Videnskabelse	• Forskning og udvikling: Et selvstændigt felt • Bearbejdning af erfaringer fra egen praksis
Videnbearbejdning	• Udnyttelse af komplette databaser (f.eks. CRM-systemer) • Bruge af meta-databaser (f.eks. kilder til data) • Rapportskrivning • Projektmøder
Videnformidling	• Baseret på dokumentation eller personbåret Struktureret, planlagt: Uddannelse, konferencer o.l. • Tilgængelighed baseret på netværk (Inter-/Intranet) • Organisk/ad hoc: Samarbejdsprocesser m.v.

"..nogle markante træk ved de fire faser i en forretningskritisk process" (s176)

Videnledelse i praksis

Skabelse af ny viden	Tid brugt på forskning og udvikling belønnes Synliggørelse af nye resultater Tildeling af ressourcer til forskning og udvikling Eksperimenter som positiv værdi
Indsamling	At være opsøgende (deltagelse i kongresser, faglige netværk m.v.) som positiv værdi Let tilgængelighed (Internetadgang, abonnement på tidsskrifter o.l.) Tildeling af ressourcer Belønning af tidsforbrug
Dokumentation	Velfungerende Intranet Aktiviteter, hvor dokumenteret viden synligt genbruges (intern undervisning, erfaringsudveksling) Tid brugt på dokumentation belønnes Ressourcer tildeles
Formidling	Tid brugt på formidling belønnes Måling og belønning af publikationer, optræden på konferencer o.l. Ressourcer tildeles (hjælpemidler, m.v.) Synlig anerkendelse af indsatsen Træning, erfaringsudveksling på området formidling
Tilegnelse af viden	Tid brugt på kompetenceudvikling belønnes Kvalifikationsløn Ressourcer tildeles (kursusmidler m.v.) Ledelse signalerer med egen adfærd at tilegnelse af ny viden er en positiv værdi

Check: Hvordan opfattes det enkelte tiltag af størstedelen af medarbejderne, som udsættes for det? Som incitament eller barriere?

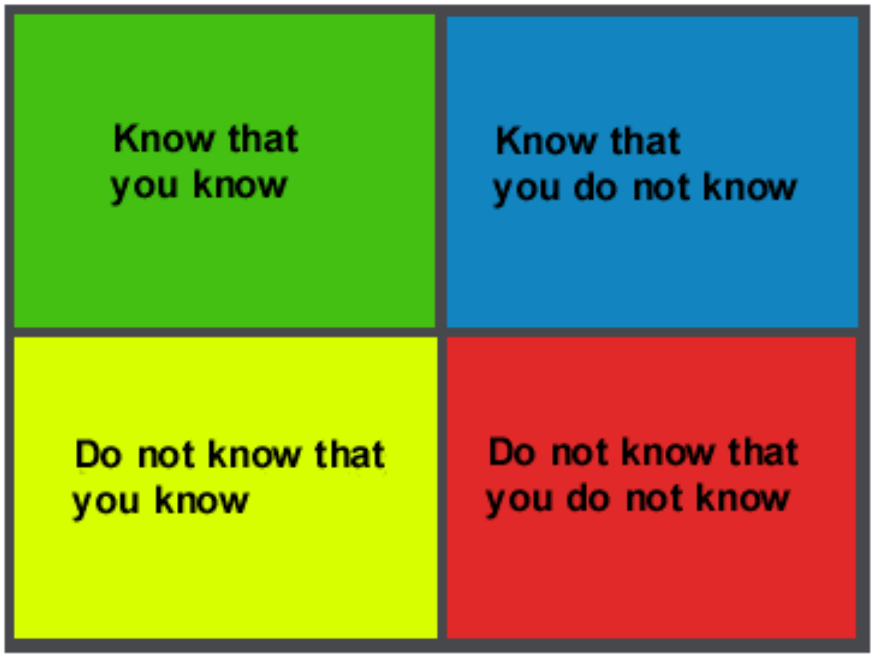
Fokuser på indsatsområderne

På grundlag af de beskrevne forretningskritiske videnprocesser skal der tages stilling til, hvilke forhold, der har brug for en særlig ledelses- og udviklingsmæssig opmærksomhed. Når måling af viden bruges internt som led i den løbende ledelse og udvikling af organisationen, er det vigtigt at holde sig for øje, at det vi måler på, er det vi gør noget ved. Derfor er det centralt at få udvalgt de mest kritiske videnprocesser. Typiske eksempler kan være:

- Kendskab til kunders og brugeres ønsker til virksomheden
- Samspil med kunder og/eller leverandører
- Indsigt om konkurrenter og andre udbydere
- Image og social ansvarlighed
- Produktudvikling med henblik på kvalitet/innovation/hastighed
- Kvalitetsstyring og -udvikling
- Tværorganisatorisk samarbejde/projektledelse og -deltagelse
- Løbende fornyelse og forandring – organisation og arbejdsprocesser
- Kompetenceudvikling af alle/udvalgte nøglemedarbejdere
- Rekruttering af nye medarbejdere
- Arbejdsmiljø og trivsel.

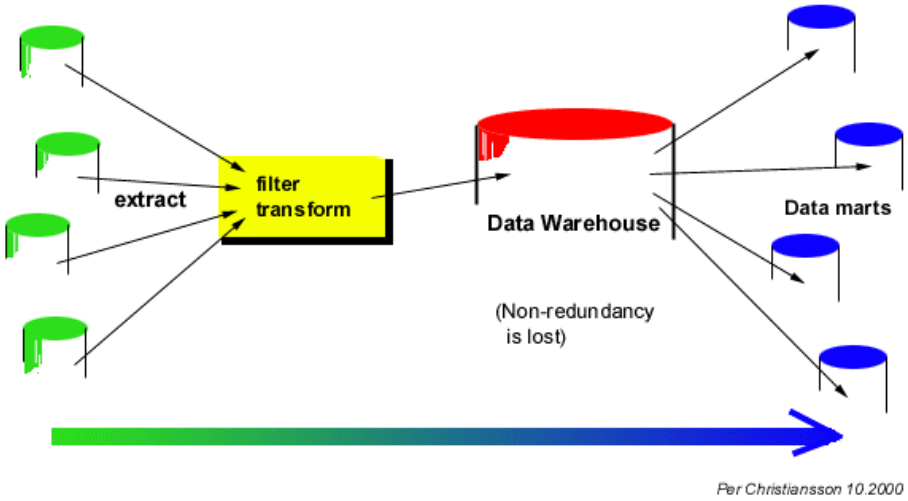
More tot read:
Bendix H, Harbo A, 2004, "Videnledelse i praksis - en brugsbog". Jurist- og • Økonomforbundets Forlag, København (275 pp).(ca 475 DKK).

Know that you know, ….



Do you (your organisation) not know what you know?

Data Mining, Data Warehousing



Data Warehouse (DW) = A data warehouse is a central repository for all or significant parts of the data that an enterprise's various business systems collect.

The DW does not change but expands it's content at certain time points.

Data warehousing activities involves

- *capturing* data from many sources (extraction from e.g. database back-up using information from log-files)
- *filtering* data
- *transforming* data (also adding meta data such as technical/administrative [data sources, structures,..] and user oriented [data owner, user, generation time, ...)
- *aggregating* data

Star Schemes (one central table with sub tables in star formation) are used to pre-sort data (partly redundant) for downloading to different Data Marts. All data in a star scheme are centered round a subject (fact table e.g. sales with calculated costs, number of sold products,...) with keys to surrounding dimensional tables (product, customer, time point,...). Different stars are constructed to support e.g. sales, customer relations and storage departments.

From http://searchsqlserver.techtarget.com/definition/data-mart (my emphasis)
"In practice, the terms data mart and data warehouse each tend to imply the presence of the other in some form. However, most writers using the term seem to agree that the design of a *data mart tends to start from an analysis of user needs* and that a *data warehouse tends to start from an analysis of what data already exists* and how it can be collected in such a way that the data can later be used. A data warehouse is a central aggregation of data (which can be distributed physically); a data mart is a data repository that may derive from a data warehouse or not and that emphasizes ease of access and usability for a particular designed purpose. In general, a data warehouse tends to be a strategic but somewhat unfinished concept; a data mart tends to be tactical and aimed at meeting an immediate need."

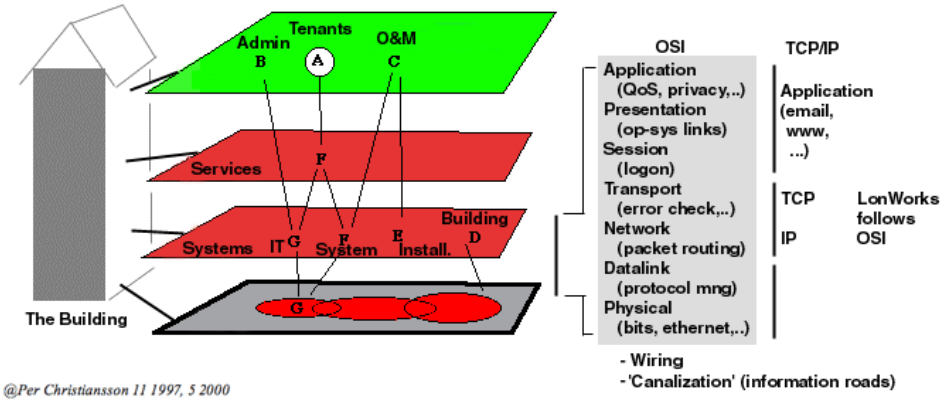
Data Mining, Data Warehousing

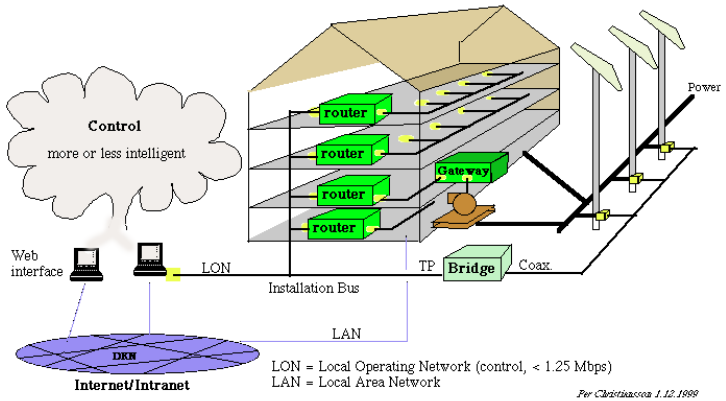
Data mining = Data mining is sorting through data to identify patterns and establish relationships. (see further http://searchsqlserver.techtarget.com/definition/data-mining)

Data mining results include:

- *Associations*, or when one event can be correlated to another event (beer purchasers buy peanuts a certain percentage of the time)
- *Sequences*, or one event leading to another later event (a rug purchase followed by a purchase of curtains)
- *Classification*, or the recognition of patterns and a resulting new organization of data (for example, profiles of customers who make purchases)
- *Clustering*, or finding and visualizing groups of facts not previously known
- *Forecasting*, or simply discovering patterns in the data that can lead to predictions about the future

Intelligent Buildings





"Intelligent buildings are buildings that through their physical design and IT installations are responsive, flexible and adaptive to changing needs from its users and the organisations that inhabit the building during it's life time. The building will supply services for its inhabitants, its administration and operation & maintenance. The intelligent building will accomplish transparent 'intelligent' behaviour, have state memory, support human and installation systems communication, and be equipped with sensors and actuators".

Christiansson P (2000) "Knowledge Representations and information Flow in the Intelligent Building". Proceedings of he Eighth International Conference on Computing in Civil and Building Engineering. ICCCBE-VIII 2000 (eds: Fruchter R, Pena-Mora F, Roddis K), ISBN 0-7844-0513-1. American Society of Civil Engineers, Reston, Virginia, USA. (Stanford University, USA. August 14-17, 2000). (pp. 604-611).

Intelligent Buildings history

- In 1982 AT&T establishes the concept "INTELLIGENT BUILDINGS" due to marketing reasons.
- The INFORMART building is erected in Dallas containing latest IB systems on display.
- 1984-85 The Smart House Development USA (National Association of Home Builders, NAHB)

- 'Automated Buildings', 'High Tech. Buildings', and 'Smart Houses'

- Services for sustainable performance
- Services for human/building interaction
- Services for health and well-being

Intelligent Buildings history

In 1986 we arranged a national Intelligent Office workshop at Lund University Sweden, where some still valid conclusions were drawn

- man/machine environment important,
- lack of knowledge, information vulnerability,
- flexibility requirements not fulfilled,
- too little holistic problem views,
- new building construction coordination and procurement forms needed,
- lack of standards..
-

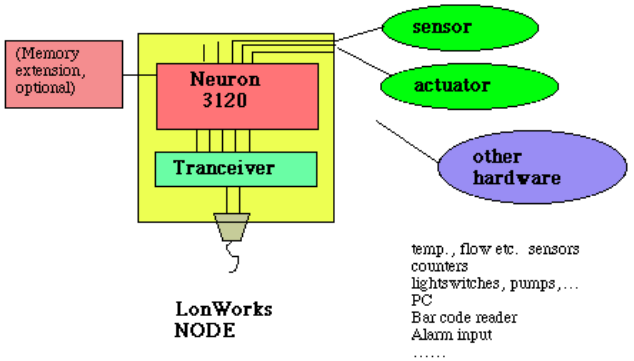
Services announced around year 2000 by IB-system companies were typically - fire alarm, energy control, heating control, telephony/computer net, ventilation control, climate, surveillance, lightning, power, security, passage control, and automatic door functions.

Intelligent Buildings history

Around 10 years ago there started to be more focus on broader social and life-quality end-user aspects on services e.g. for example elderly/handicap living support, home health care, and home distant working.

A number of protocols and network solutions to integrate more or less intelligent sensor/actuator control units have been developed.

- 1990 LonWorks technology work starts (LON), Local Operating Network for IB systems,
- EIB, European Installation Bus, and later KNX (ISO/IEC 14543),
- BACnet, a Data Communication Protocol for Building Automation and Control Networks,
- OSGi, Open Service Gateway Initiative,
- ZigBee,
- Z-Wave
- ….. RFID (Radio-frequency identification)



Intelligent Buildings driving forces and trends

The technology driving force has been significant in development of the Intelligent and Responsive Buildings and Intelligent Cities. Such as

- Moore's law
- spread and standardisation of Internet,
- increased bandwidth within Internet,
- communication standards development,
- embedded intelligence with sensors and actuators connection,
- New network services and service-oriented architectures (SOAP, WDSL, OGSA,..)

We will see an increasing focus on ontology development as a necessary pre-requisite for services and ICT systems inter-operability.

- The Semantic Web has set new focus on ontology development.
- Ontologies in general today mainly support the technical service layers and to a lesser extent the business application layers.

Virtual building (VB) models access is getting more standardised through use of the IFC standard, and will thereby be easier to integrate as a resource in IB service systems.

Intelligent Buildings properties

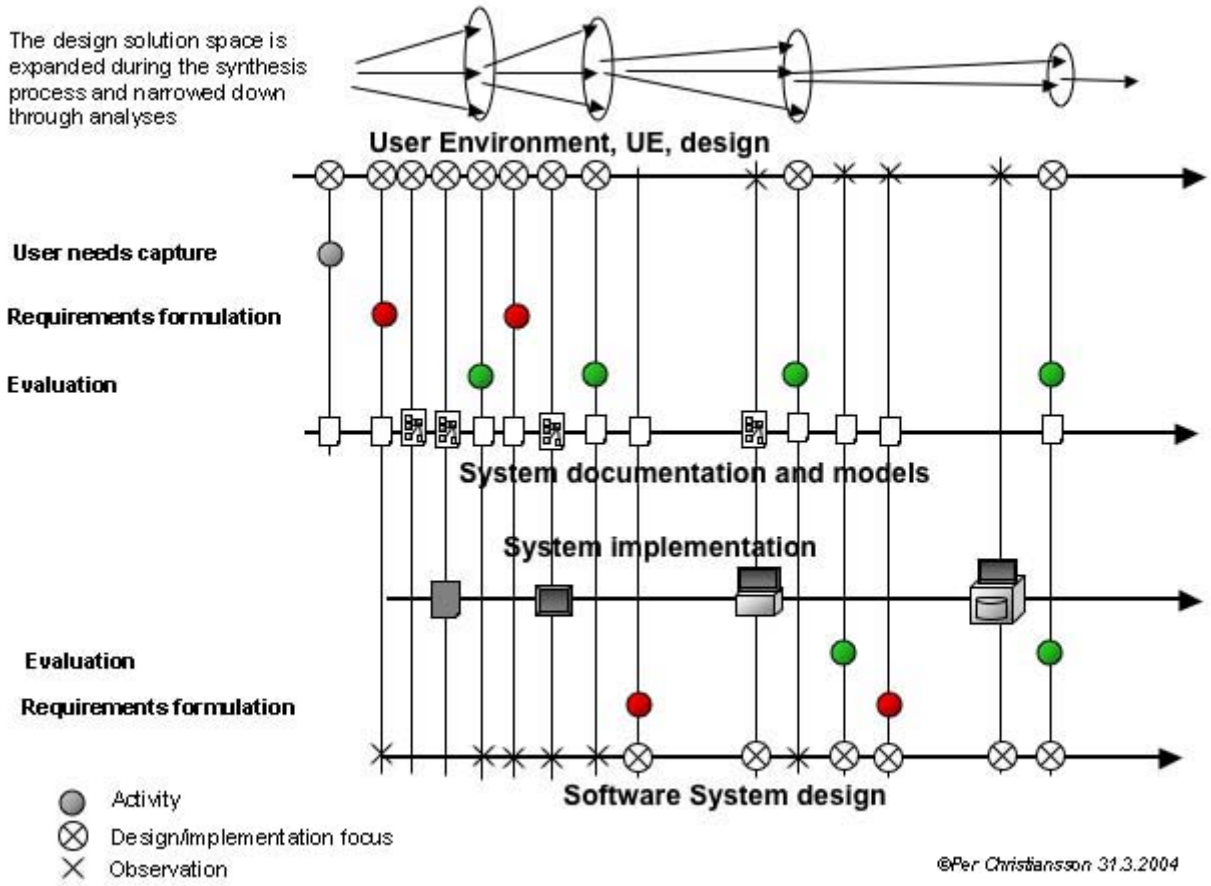
- be *flexible* and *responsive* to different usage and environmental contexts such as office, home, hotel, and industry invoking different kinds of loads from nature, people, and building systems,
- be able to *change states* (clearly defined) with respect to functions and user demands over time and building spaces (easy to program and re-program during use)
- support *human communication* (between individuals and groups)
- provide *transparent* intelligence, simple and understandable to the users (support ubiquitous computers and networks)
- have a distributed long term and short term *memory*
- contain tenant, O&M, and administration *service systems*
- support introduction of *new* (sometimes not yet defined) services
- be equipped with *sensors* for direct or indirect input and manipulation of signals from users, systems and the building structure
- be equipped with *actuators* for direct or indirect manipulation installations and the building structure
- accomplish *'intelligent' behaviour* (self diagnosis, trigger actions on certain events and even learn from use)
- *integrate* different IB systems to form complex systems
- contain IB life time *standardized* solutions as far as possible
- be well *documented* (in 3D with functional descriptions) available in Virtual Reality with physical structure overlay
- provide *canalization* (information roads) that shall house 'wires' carrying new Services
- be able to handle *high band width* information transfer.
- provide *dynamic secure information domains* (i.e not based on a non-routed Ethernet in a residential block)
- be open to efficient communication with external *applications*

(*Christiansson, 2000*)

END

http://it.civil.aau.dk

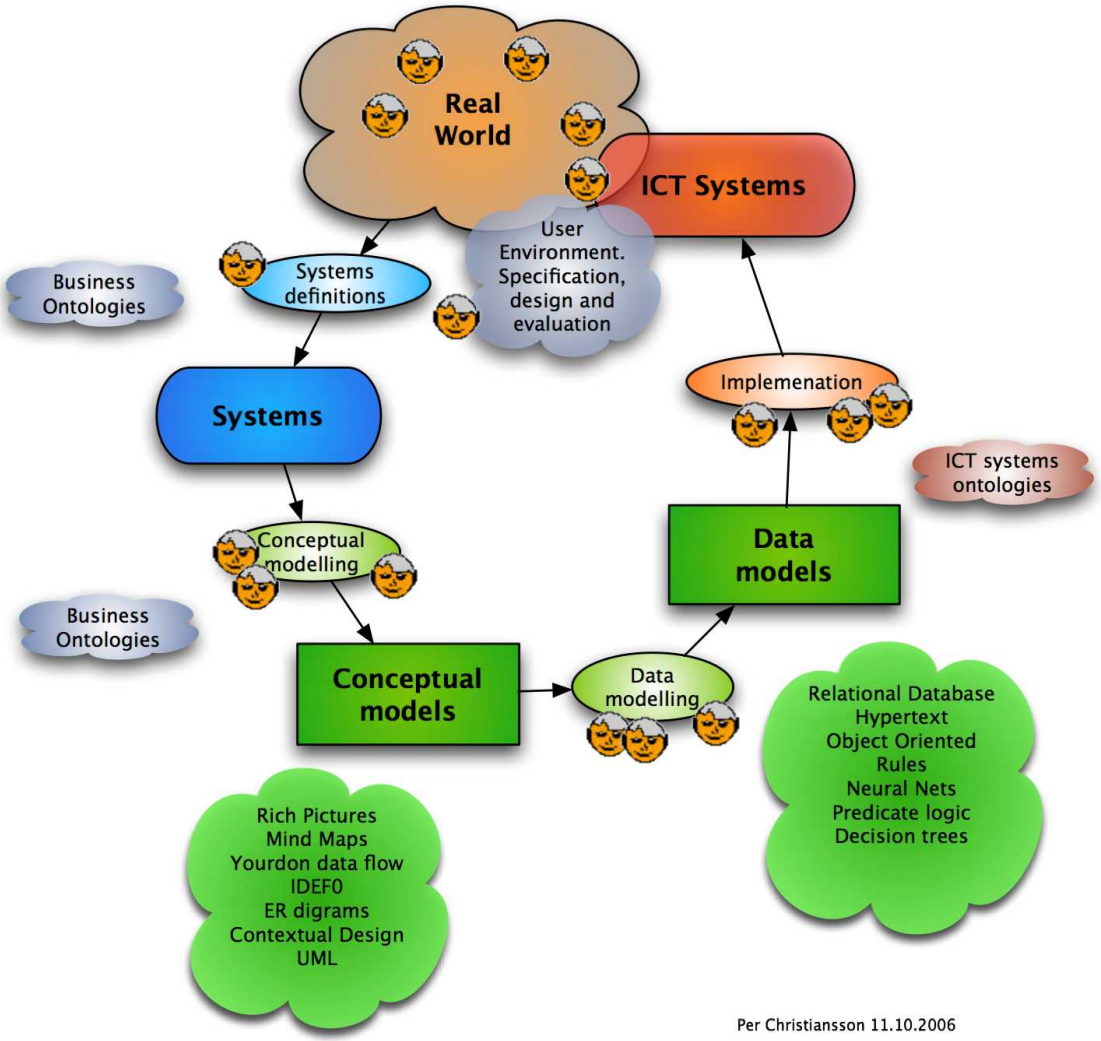
MODELS OF THE REAL WORLD



The early design process focuses on user environment, UE, design/implementation and the later phases on software development and implementation.

The UE design including user needs capture and user requirements formulations can be supported by contextual design methodology. Different evaluation paradigms can be used as design/implementation progresses.

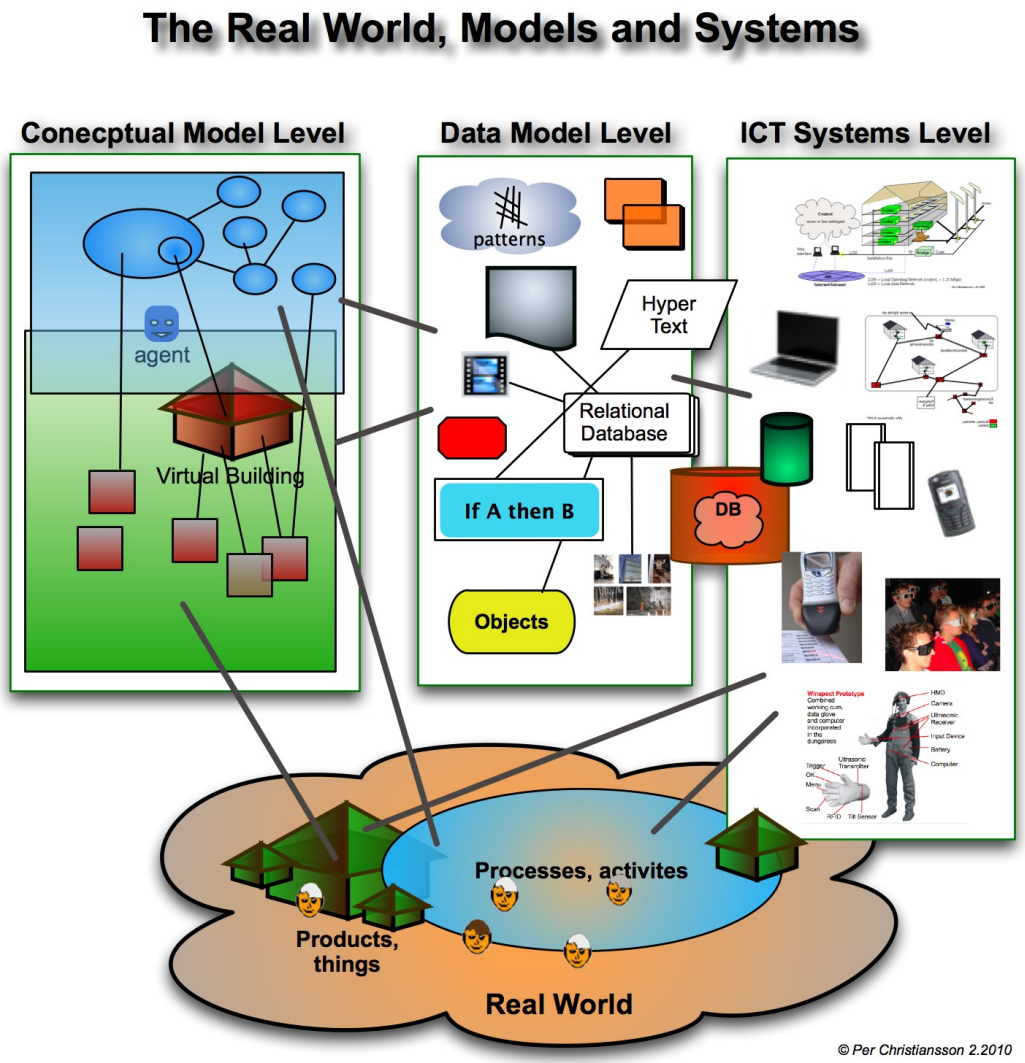
SYSTEM DEVELOPMENT



In the real world we identify activities, things, processes, context, and persons.

The real world can be described as (interrelated) systems (no de-facto structure is available today) to accomplish different functions e.g. a comfort system to provide personal living and working quality, personal transport system, load carrying building system, escape system, and communication systems (collaboration, knowledge transfer, mediation, virtual meeting).

MODELS OF THE REAL WORLD



The HOLISTIC view
The holistic view.

We use different kinds of ICT support in the building process and the built environment.

The ICT systems support different functionalities in the building process and built environment.