

Development of Educational Software

Knowledge Management

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Lecture 5

Knowledge Management

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Objectives

- What is Knowledge Management (KM)?
- What are the driving forces?
- Role of KM in today's organization
- What is Knowledge Management System (KMS)?
- Classification of Knowledge Management Systems
- Effective Knowledge Management

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Knowledge as Key Resource

- *"Knowledge has become the key resource, for a nation's military strength as well as for its economic strength... is fundamentally different from the traditional key resources of the economist – land, labor, and even capital..."*
- *we need systematic work on the quality of knowledge and the productivity of knowledge ...*
- *the performance capacity, if not the survival, of any organization in the knowledge society will come increasingly to depend on those two factors" [Drucker, 1994]*

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What is Knowledge Management?

- Knowledge management (KM) may be defined simply as doing what is needed to get the most out of knowledge resources.
- *KM focuses on organizing and making available important knowledge, wherever and whenever it is needed.*
- KM is also related to the concept of *intellectual capital*

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Forces Driving Knowledge Management

- **Increasing Domain Complexity:** Intricacy of internal and external processes, the rapid advancement of technology.
- **Accelerating Market Volatility:** The pace of change, or volatility, within each market domain has increased rapidly in the past decade.
- **Intensified Speed of Responsiveness:** The time required to take action based upon subtle changes within and across domains is decreasing.
- **Diminishing Individual Experience:** High employee turnover rates have resulted in individuals with decision-making authority having less tenure within their organizations than ever before.

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Classification of Knowledge Management Systems

Knowledge Discovery Systems
Knowledge Capture Systems
Knowledge Sharing Systems
Knowledge Application Systems



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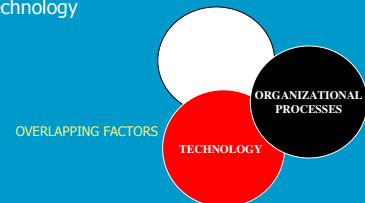
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Effective Knowledge Management (1)

- 80% - Organizational processes and human factors
- 20% - Technology



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Effective Knowledge Management (2)

- Knowledge is first created in the people's minds.
- ***KM practices must first identify ways to encourage and stimulate the ability of employees to develop new knowledge.***



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Effective Knowledge Management (3)

- KM methodologies and technologies **must enable effective ways to elicit, represent, organize, re-use, and renew this knowledge.**



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Basic Knowledge-Related Definitions

Common Sense	Innate ability to sense, judge, or perceive situations; grows stronger over time
Fact	A statement that relates a certain element of truth about a subject matter or a domain
Heuristic	A rule of thumb based on years of experience
Knowledge	Understanding gained through experience; familiarity with the way to perform a task; an accumulation of facts, procedural rules, or heuristics
Intelligence	The capacity to acquire and apply knowledge

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Data, Information, and Knowledge

Data: Unorganized and unprocessed facts; static; a set of discrete facts about events

Information: Aggregation of data that makes decision making easier

Knowledge is derived from information in the same way information is derived from data; it is a person's range of information

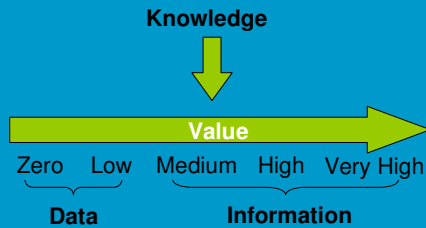
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Relationship between data, information and Knowledge



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Types (Categorization) of Knowledge

Shallow (readily recalled) and **deep** (acquired through years of experience)

Explicit (already codified) and **tacit** (embedded in the mind)

Procedural (repetitive, stepwise) versus **Episodal** (grouped by episodes)

Knowledge exist in **chunks**

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Explicit and Tacit Knowledge

Explicit (knowing-that) knowledge: knowledge codified and digitized in books, documents, reports, memos, etc.

Tacit (knowing-how) knowledge: knowledge embedded in the human mind through experience and jobs



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Illustrations of the Different Types of Knowledge

		General	Contextually Specific	Technically Specific
Declarative	Explicit	A book describing factors to consider when deciding whether to buy a company's stock. This may include price to earnings ratio, dividends	A company document identifying the circumstances under which a consultant team's manager should consider replacing a team member who is having problems with the project.	A manual describing the factors to consider in configuring a computer so as to achieve performance specifications
	Tacit	Knowledge of the major factors to consider when deciding whether to buy a company's stock.	A human relations manager's knowledge of factors to consider in motivating an employee in a particular company.	A technician's knowledge of symptoms to look for in trying to repair a faulty television set.
Procedural	Explicit	A book describing steps to take in deciding whether to buy a company's stock.	A company document identifying the sequence of actions a consultant team's manager should take when requesting senior management to replace a team member having problems with the project.	A manual describing how to change the operating system setting on a computer so as to achieve desired performance changes.
	Tacit	Basic knowledge of the steps to take in deciding whether to buy a company's stock.	A human relations manager's knowledge of steps to take in motivating an employee in a particular company.	A technician's knowledge of the sequence of steps to perform in repairing a television set.



Knowledge management with Performer

Charles van der Mast
In4145 Educational software

TU Delft

Both University of Technology

Research project

Performer Knowledge Management

Research Results
Atos Origin, TU Delft, ULeiden

[thanks to Jan-Willem van Aalst]

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Both University of Technology

Goals

Analyzing project problems and need for improvement

- Project process improvement
- Improved interdisciplinary communication
- Learning from mistakes and best practices
- Produce sharper project bids
- Work more effectively: make more in less time

Target (Atos/Origin):

- Higher maturity level of projects
- Gain competitive edge in market
- More projects from large customers
- More money

Target (TU Delft):

- Fundamental contribution to educational Multimedia process improvement
- Apply research in real-life
- Connection to IT businesses

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Maturity level of IT projects

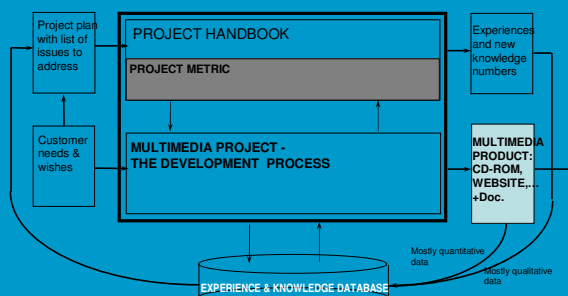
Capability Maturity Model (Humphrey/Sweet,1987, and Paulk/Curtis/Chrissis,1991):

PROCESS	TYPICAL CHARACTERISTICS	ACTIONS NEEDED TO REACH HIGHER LEVEL
5. Optimizing	Continuous process improvement by quantitative feedback from the process and from testing innovative ideas and technologies. Quantitative basis is used for continuous improvement.	Continuous process improvement through continued emphasis on process measurement and process methods for error prevention.
4. Managed	Detailed measures of the software process and product quality are collected. Both the software process and products are quantitatively understood and controlled. There is reasonable statistical control over process, costs, schedules, and quality. Organizationwide process database is in place.	Quantitative productivity plans and tracking, instrumented process environment, and economically justified technology investments.
3. Defined	Defined software process for both management and engineering activities is documented, standardised, and integrated into the development process. Projects use a documented and tailored version of the organization's process to develop/maintain software. <i>Cost is reliable, though quality is still unpredictable.</i>	Quantitative quality goals for software products through establishing and tracking process measurements and quantitative quality goals, plans, and cost/performance. Calculate cost of poor quality and compare to costs of achieving quality goals.
2. Repeatable	Basic project management processes are in place to track cost, schedule, and functionality. Necessary process discipline is in place to repeat earlier successes on projects with similar applications. Product quality is variable.	Org. standard process for developing and maintaining software, through documenting process standards and definitions, assigning process resources. Measurements of group coordination and project actions.
1. Ad hoc	Professionals driven from crisis to crisis by unplanned priorities and unmanaged change. Surprises cause unpredictable schedules, cost, and quality performance. Few processes are defined, success depends on individual's heroic actions.	Process must become stable and repeatable through estimation measurement, and planning (costs, risks, and schedule); requirements mgt; quality assurance; ability to manage subcontracts.

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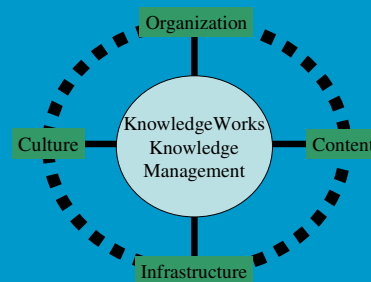
Project process using knowledge management & metric



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How to achieve this maturity level increase?



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How to make sure this works in practice

- Organization
 - Get commitment and budget to set up KnowledgeWorks Performer.
 - Get employees involved and make sure they can contribute.
 - Define responsibilities, roles, authorizations, tasks, procedures
- Culture
 - Communicate to employees why this is a step in the right direction
 - Ask people's opinions and make them part of the process
 - Communicate sufficiently, unambiguous, organize workshops
- Content
 - Create inventory of available knowledge / expertise / experiences
 - Collect this knowledge / expertise / experiences
 - Categorize and filter until best practices and best templates are left.
- Infrastructure
 - Find/create a technically suitable system able to connect geographically dispersed knowledge "islands".
 - Find/create a technically suitable system for measurement and tracking of improvements.

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Performer knowledge management

Role	Acquisition		Initiation		Realization		Completion		Evaluation	
	Assess	Make bid & contract	Start the project	Set up project	Analysis	Design	Realization	Test & accept	Impl. & operational	Report project
Commercial manager	120	57	2	6	6		6			11
Consultant	100	44			100	20				5
Project leader	120	44	2	20	2	30		12	2	1
Professional content	120			6	61	130	22	20	14	
Professional design	120			6	52	14	33	30	14	5
Professional technique	120			6	23	89	83	20	14	5

Project process defined in terms of phases, roles, objectives, and knowledge elements

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Use of Performer: statistics (July 2000)

Education Performer:	793 users (67 frequently)
Knowledge management Performer:	848 users (123)
Migration services Performer:	860 users (550)
SAP NL IS Performer:	590 users (452)
SAP NL DS Performer:	233 users (161)
Data Warehousing Performer:	540 users (196)
Interoperability Performer:	142 users (26)

In total: 4006 users
(of which 1575 frequently)

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Independent interview analysis

Analysis of 10 projects: 5 pre, 5 post Performer

Three independent researchers for the blind analysis of interviews with team members of all projects

Interview problem categories:

- PR (Project management)
- QU (Qualification of skills)
- TE (Technical issues)
- CO (Communication issues)
- PS (Psychological issues)
- CU (Customer/User issues)

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Example of interview analysis

- PR (Project management)
- QU (Qualification of skills)
- TE (Technical issues)
- CO (Communication issues)
- PS (Psychological issues)
- CU (Customer/User issues)

- 2: very negative
- 1: negative
- 0: neither neg. nor pos.
- 1: positive
- 2: very positive

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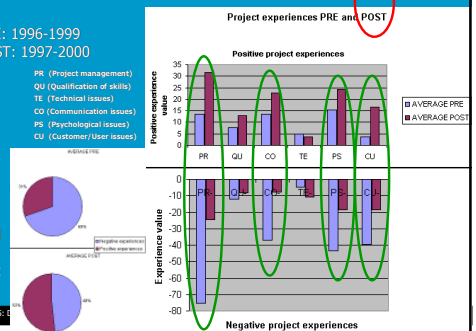


Measurement results

5 Projects PRE: 1996-1999
5 Projects POST: 1997-2000

- PR (Project management)
- QU (Qualification of skills)
- TE (Technical issues)
- CO (Communication issues)
- PS (Psychological issues)
- CU (Customer/User issues)

Results show significant increase in positive project experiences and decrease in negative project experiences



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Performer for education

- Courses HCI and Multimedia
- Here results with the course multimedia (in3620)

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MULTIMEDIA IN3620 (6 ECTS)

- Analysis, design and production of a mm cd-rom for an external client
- How to work and organize in a multidisciplinary team
- Communication with colleagues, client, users, external specialists

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Organisation of the course

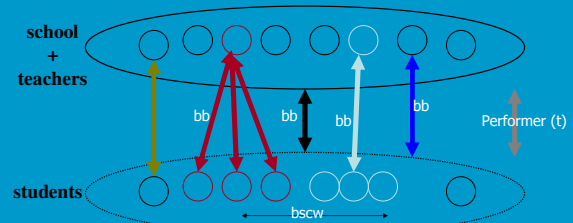
- 50-70 students
- Lectures
- Big project (for students)
- Study manual
- Client
- Blackboard for central communication
- BSCW for exchange within team
- Performer for sharing knowledge and experience with all students, including former students

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DISTANCE EDUCATION



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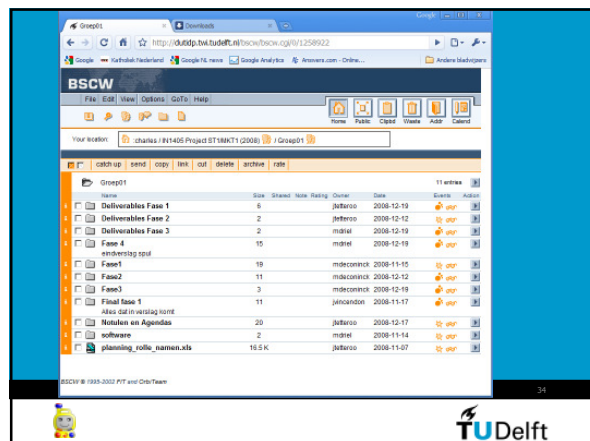


BSCW

- basic system for cooperative working
- shared workspaces
- via browser
- sharing data
- Sharing is looking, evaluating, communicating, changing, protecting, maintenance

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BSCW © 1998-2002 PIT and OloTwee

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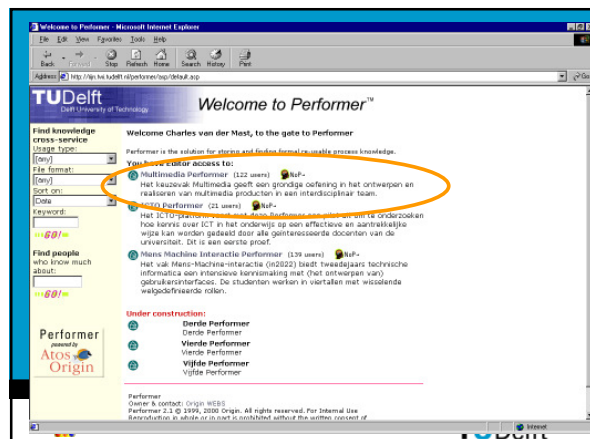


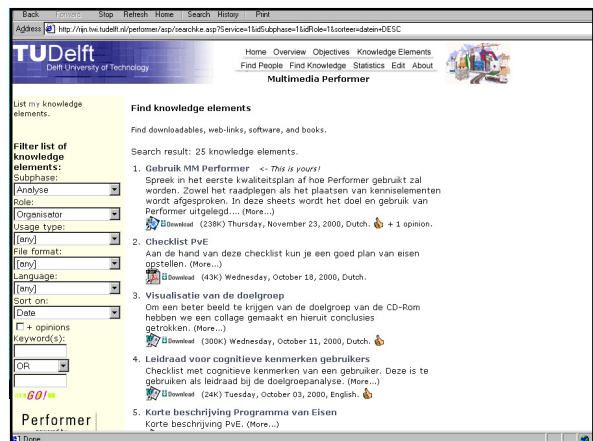
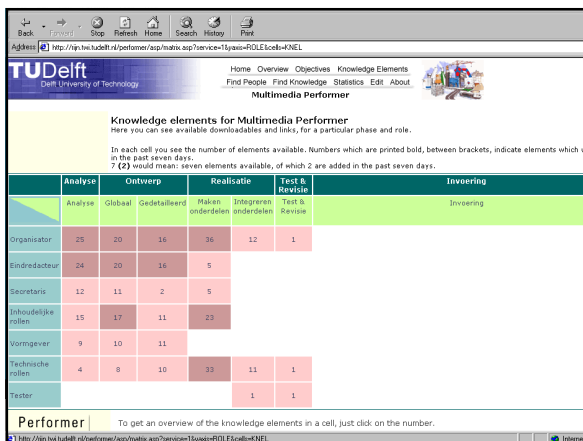
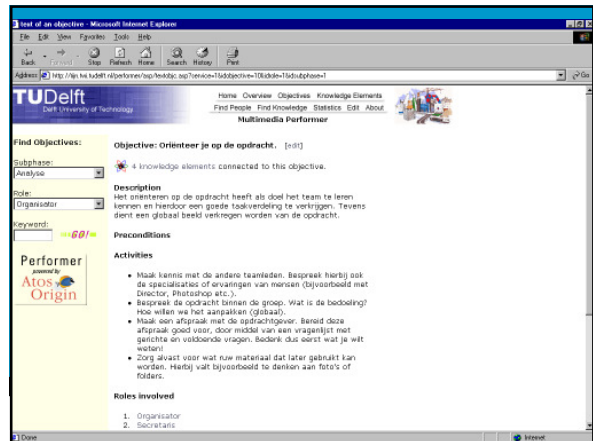
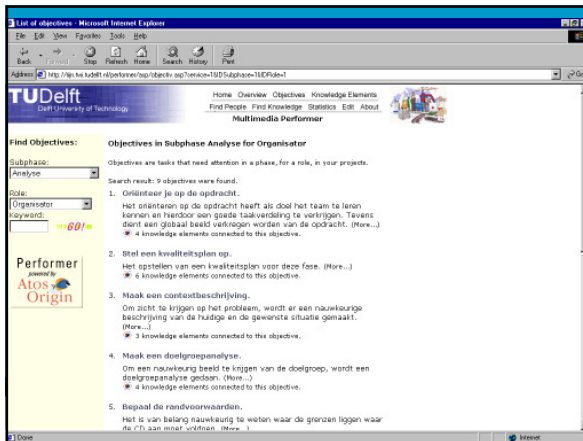
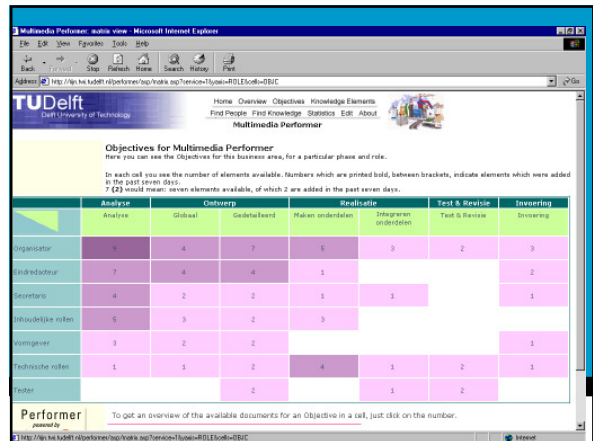
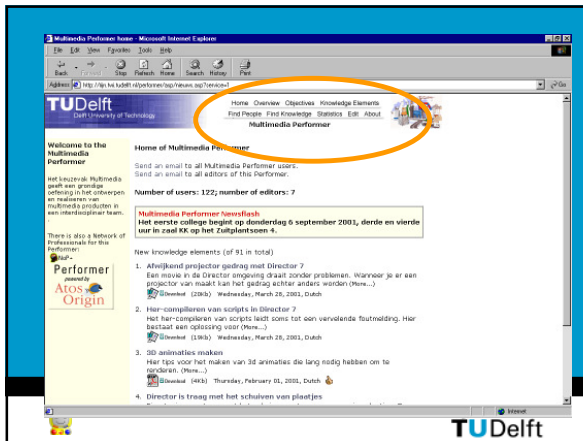
MM Performer

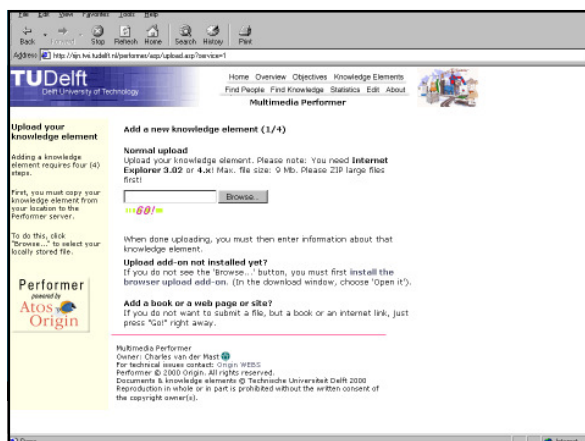
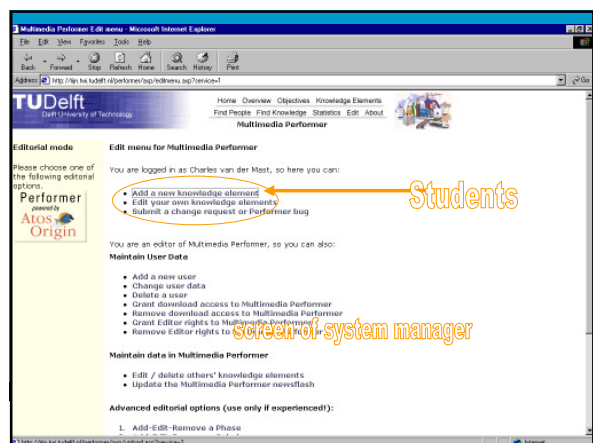
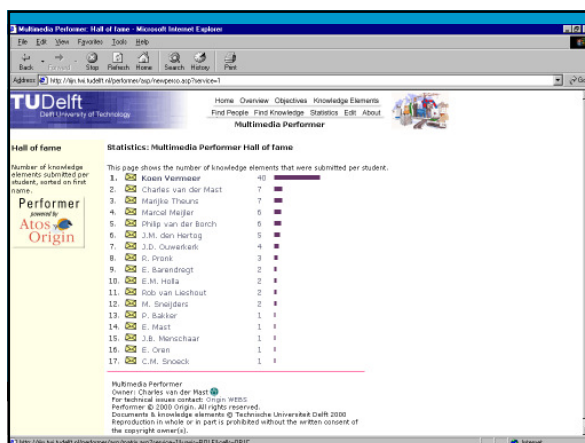
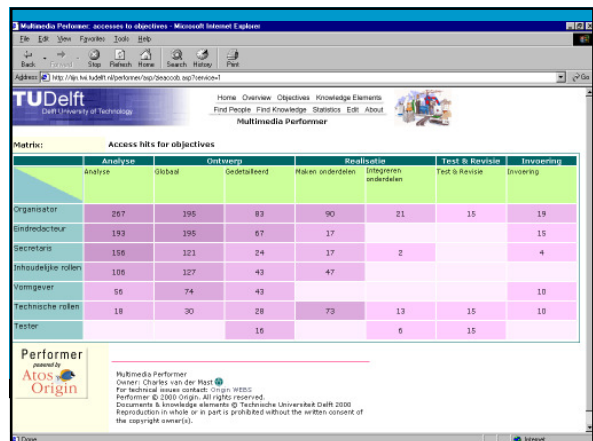
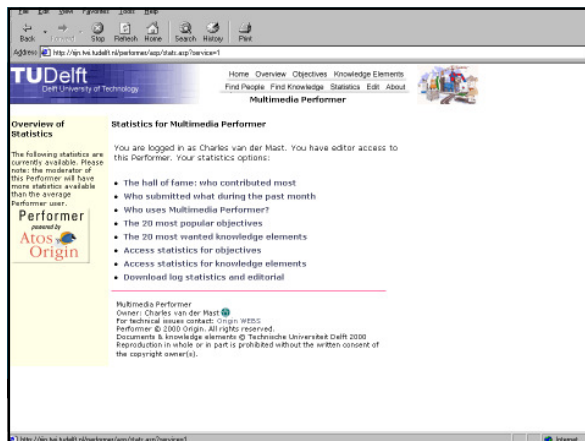
- Access via BB>Course Documents
- Manual and Coursebook at BB>Course Docs
- You will get an account + password
- Also "click to proceed", but limited rights
- Matrix with roles and phases
- Objectives and knowledge elements
- Statistics about usage by all of you
- Get and share knowledge
- ALSO: upload your own knowledge elements – presents are given for the first three approved KE

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CONCLUSION AND DISCUSSION

- the role of the teacher changes in most cases
- a new function of teaching assistant is necessary for creation and maintenance of contents in system and for administrative processes; (s)he shall work in close collaboration with the teacher
- deployment of ICT in our education will NOT decrease the cost of our education

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Aftermezzo

- My visit to Calcutta a few weeks ago: a complete system for e-learning PLUS knowledge management integrated in ONE. Sold to companies in India and US.
- Look at: <http://www.aunweshia.com>
- LearnITy 

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LearnITy™

An integrated framework for

- eLearning
- Skill Management
- Training Administration
- Knowledge Management

LearnITy collects comprehensive business intelligence across all knowledge processes, providing a unified, realistic view of learning effectiveness

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LearnITy Usage Scenarios

- Sales Training
- Employee Induction Programs
- Customer Service Training
- New Software Application Rollout Programs

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Anno 2010

- Companies all over the world are applying KM
- Performer not available anymore...
- I see that young students are missing it...
- Standardizing of ways of working by young students is lower today at EWI/CS [OK or NOT OK?]
- Conclusion? Deployment of KM in schools is expensive! Benefits? Performer may also be implemented by BSCW or even by a simple database, but...

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Summary

- Definitions and classifications of KM
- Capability Maturity Level
- Some examples in business and schools

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References

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- Jan-Willem van Aalst & Charles van der Mast (2002), A Knowledge Management Instrument to Support Learning of Highly Interactive Systems Development, *Proceedings of the 7TH Annual Euromedia Conference 2002 Modena, Italy, April 15-17*, pp. 105-112.
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