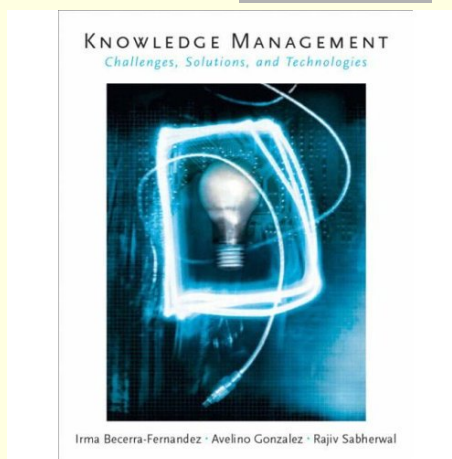


SSE3: Advanced Software Technologies for Knowledge Management

Professor Uffe Kock Wiil
The Maersk Mc-Kinney Moller Institute
University of Southern Denmark

Lecture 1: Topics

- Course introduction
- Knowledge management
 - Chapter 1-3
 - Becerra-Fernandez, Gonzalez, and Sabherwal
 - Knowledge management challenges, solutions, and technologies
 - Pearson Prentice Hall
- Course perspective on knowledge management



Course introduction

- Uffe Kock Wiil
 - Who is he?
- Course description
 - What does it say?
- Web site
 - Topics?
- Project
 - What?, How?, When?
- Exam
 - When?, Who?, How?
- Students
 - Who?
 - Why?
- Course policy
 - Portables
 - Mobile phones
- Course format

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Lecture 1

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Uffe Kock Wiil

- Professor at MIMI, SDU since 2004
- > 20 years of research experience
 - KM, HT, CSCW, ST, DS
 - Counterterrorism, planning, healthcare, learning, programming, innovation, ...
- > 130 publications
- > 1000 citations
- This course can be seen as an introduction to some of my primary research interests

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Lecture 1

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Course description

■ Main Topics

- Many human beings are engaged in knowledge management tasks as part of their daily work, education, etc. Knowledge management tasks are carried out both by individuals and by groups as part of collaborative endeavors. Such collaborative endeavors are complicated when the process needs to accommodate individuals that are distributed in time and space. **Software tools** based on advanced techniques and technologies **can** in many cases **provide powerful support for knowledge management tasks**. Tedious (sub) tasks can potentially be automated or at least supported by software tools.
- The course will focus on (1) analyzing and understanding complex knowledge management tasks and (2) understanding and applying advanced software technologies (such as **hypertext** structuring and **computer supported cooperative work**) to support these tasks.
- The course will focus on knowledge management tasks related to selected application domains (such as **healthcare**, **counterterrorism**, programming, **planning**, and learning).

Course description

■ Objectives and Assessment Criteria

After completing this course, the student is able to:

- show a theoretical and practical foundation for understanding and applying selected advanced software technologies to support knowledge management tasks
- analyze existing knowledge management tasks
- design and implement support for knowledge management tasks based on selected advanced software technologies

■ Teaching language

- English

■ Type of course

- Lectures, seminars, discussions, and project work

Course description

- Examination requirements
 - Project done by groups of students
- Evaluation
 - Individual oral examination based on the project and the overall syllabus for the course and evaluated according to the Danish 7-point grading scale with internal co-examiner

Website

- BlackBoard
 - A link to the course website has been placed in a permanent announcement in BlackBoard
- Course website
 - <http://www.mip.sdu.dk/~ukwiil/rmsse3>
 - Will be updated as the course progresses
- Topics and readings are / will be listed

Website (as of 6.4)

RMSSE3 2010: Advanced Software Technologies for Knowledge Management

Course overview

All lectures take place in the seminar room in the Maersk building at Campusvej 55. The schedule below will be updated during the course.

Day	Subject	Literature
Wed 07-04 12:15	Knowledge management	KM book: chapters 1+2+3
Mon 12-04 12:15	Hypertext	Paper 1, Paper 2
Fri 16-04 10:15	Hypertext	TBA
Mon 19-04 12:15	Hypertext CSCW	TBA
Wed 21-04 12:15	CSCW	TBA
Mon 26-04 12:15	CSCW	TBA
Wed 28-04 12:15	Application domains	TBA
Mon 03-05 12:15	Application domains	TBA
Wed 05-05 12:15	Project work (meetings)	None
Mon 10-05 12:15	Project work (on your own)	None
Wed 12-05 12:15	Project work (on your own)	None
Mon 17-05 12:15	Project work (meetings)	None
Wed 19-05 12:15	Project work (on your own)	None
Wed 26-05 12:15	Project work (meetings)	None

Literature

- [KM book](#) (only chapters 1+2+3)
- [Paper 1](#)
- [Paper 2](#)
- ...

Project

- Must be handed in by May 31, 2010
- [See specific details here](#)

Teacher

- [Uffe Kock Wi](#)

Course description

- [RMSSE3](#)

Exam

- Takes place on June 2, 2010
- More details later

Project

■ What?

- Select relevant knowledge management problem
 - Must be approved by the teacher
- Analyze and describe the problem using theory related to the course
- Design a solution to solve the problem using theory related to the course
- Implement and evaluate a (partial) software prototype as a proof of concept

Project

- What? – deliverables
 - Project report
 - Working software prototype
- How?
 - In groups of 3-4 students
- When?
 - Deadline: May 31, 2010 at 12.00 (GMT+1)
- More detailed description on the website!

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RMSSE3 Project: Software Tools for Knowledge Management

Uffe Kock Wil
The Maersk Mc-Kinney Møller Institute
University of Southern Denmark
March 24, 2010

The project must focus on development of software tools for knowledge management. The project must be performed in groups of 3-4 students. The project should be documented in two parts: a project report documenting the various phases of the project (see below) and a working software tool (prototype). The project report is expected to be at least 15-20 pages. The software tool should support a selected knowledge management task related to the overall project focus. The two deliverables must be handed in no later than May 31, 2010 at 12.00 (GMT+1) in electronic form to: ukwil@mmmi.sdu.dk. The following phases should be part of the project (all phases must be sufficiently documented in the project report):

Selection of overall knowledge management problem

- Find an overall case that you wish to explore in your project.
- Argue for the selection of the case.
- The selected case must be approved by the teacher.

Analysis

- Analyze the case.
- Identify relevant knowledge management problems.
- Describe the case using theory related to the course.
- The teacher can on request suggest (additional) relevant literature to include in this part.

Design

- Design a solution to solve the identified problems using theory related to the course.
- The teacher can on request suggest (additional) relevant literature to include in this part.
- Select a specific part of the solution for the implementation.
- Argue for the selected part.

Implementation

- Make a proof of concept implementation resulting in a software tool (prototype) that supports the selected knowledge management task.

Evaluation

- Evaluate your software tool – involving people outside the project.
- Define possible future work to improve the software tool based on the evaluation.
- Argue how well the overall solution and the software tool support the knowledge management problem.

Good cases exist virtually everywhere where people work with knowledge: private companies (service, production, etc.), public organizations (city, region, state, school, university, hospital, etc.), other (non government) organizations (sports clubs, leisure, aid, trade, etc.).

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Exam

- When?
 - June 2, 2010
- Who?
 - Uffe Kock Wiil (teacher)
 - Nasrullah Memon (internal examiner)
- How?
 - Topics known in advance
 - Group presentation of project
 - 10 min presentation covering topic (individual)
 - Question & answer session (individual)

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Students (as of 6.4)

- Alexandru Florentin Dinca
- Andrei Radu Creosteanu
- Anders Steffen Öding Andersen
- Iztok Zuzek
- Jens Bjarke Pedersen
- Kalle Grafström
- Kristoffer Ravnholt
- Lasse Lund Sten Jensen
- Martin Moghadam

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Why are you here?

- “The topics sounds interesting and relevant”
- “I like the courses that include project work”
- “I need the 5 ECTS”
- “I could not find other SE courses to take”
- “The other courses sounded worse”
- ??

Course policy

- Portable computers must be closed during lectures!
- Mobile phones must be turned off during lectures!
 - A phone that interrupts the class will result in a penalty (bringing cake to next lecture)

Course format

- Lectures
 - Slides
 - Board
 - Demos
 - Exercises
 - Discussions
- Goal
 - 45 min; 15 min; 45 min
- Project work
 - Meetings with teacher
 - On your own
- Slides will be made available on website after lecture
- How to study?
 - Whatever works best for you
- Literature can be both background and covered in lecture
- I assume that you wish to follow the lectures if you are here

Knowledge management

- Topics
 - Definition
 - Data, information, knowledge
 - Classification of knowledge
 - Knowledge management processes

What is KM?

- Knowledge management (KM) may simply be defined as *doing what is needed to get the most out of knowledge resources*
- In general, 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

Example

- The local independent auto repair shop
- Former Toyota mechanic; now own business
- The business grew larger over the years
- More involved in management and training of staff
- Loses good people to the local Toyota dealership that can pay a better salary
- Needs to find a way to capture and disseminate knowledge to his mechanics

What is KM?

- Knowledge is a fluid mix of framed experience, values, contextual information, expert insights, and intuition that provides an environment and framework for evaluating and incorporating new experiences and information. It originates in individual minds but is often embedded in organizational routines, processes, practices, systems, software, and norms.
- Knowledge management is the creation, distribution, and exploitation of knowledge to create and retain greater value from core business competences.
- Knowledge management is for everybody.

What is Data?

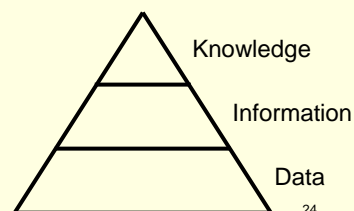
- Data comprises facts, observations, or perceptions
- Data represents raw numbers or assertions

What is information?

- Information is processed data
- Information is a subset of data, only including those data that possess context, relevance and purpose
- Information involves manipulation of raw data

What is knowledge?

- Knowledge is at the highest level in a hierarchy with information at the middle level, and data to be at the lowest level
- It is the richest, deepest & most valuable of the three
- Information that enables action and decision
- Information with direction



Example 1

■ Data

- A restaurant sales order including two large burgers and two medium-sized vanilla milkshakes is an example of data.

Example 1

■ Information

- For the manager of the restaurant, the numbers indicating the daily sales (in dollars, quantity, or percentage of daily sales) of burgers, vanilla milkshakes, and other products are considered information. The manager can use such information to make decisions concerning pricing and raw material purchases.

Example 1

■ Knowledge

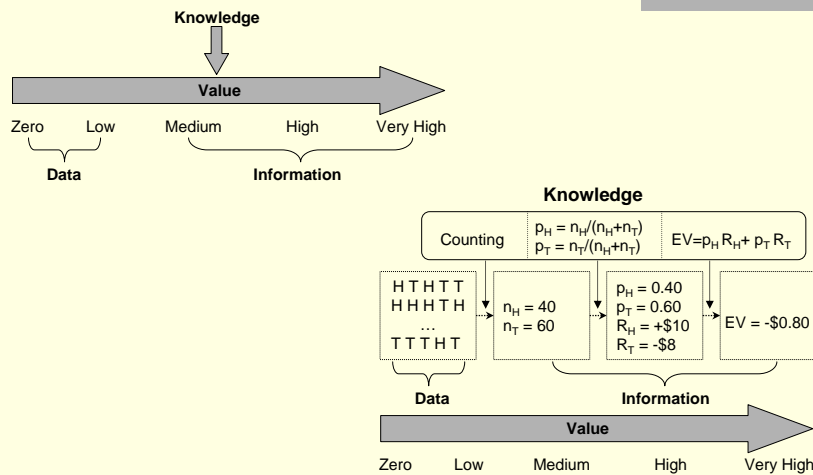
- The daily sales of burgers can be used, along with other information (e.g., information on the quantity of bread in the inventory), to compute the amount of bread to buy. The relationship between the quantity of bread that should be ordered, the quantity of bread currently in the inventory, and the daily sales of burgers (and other products that use bread) is an example of knowledge.

Example 1

■ Knowledge

- Understanding this relationship (which could conceivably be stated as a mathematical formula) helps to use the information (on quantity of bread in the inventory, sales of burgers, etc.) to compute the quantity of bread to be purchased. However, the quantity of bread to be ordered should be considered information and not knowledge. It is simply more valuable information.

Example 2



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Lecture 1

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Classification of knowledge

- Declarative knowledge (facts; substantive knowledge) focuses on beliefs about relationships among variables
 - “Know what”
- Procedural knowledge (e.g., how to ride a bicycle) focuses on beliefs relating sequences of steps or actions to desired (or undesired) outcomes
 - “Know how”

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Lecture 1

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Classification of knowledge

- Explicit knowledge refers to knowledge that has been expressed into words and numbers
 - Can be shared formally and systematically
- Tacit knowledge includes insights, intuitions, and hunches
 - Difficult to express and formalize and therefore difficult to share
 - Likely to be personal and based on individual experiences and activities

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Lecture 1

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Classification of knowledge

- General knowledge is possessed by a large number of individuals and can be transferred easily across individuals
- Specific knowledge, or “idiosyncratic knowledge,” is possessed by a very limited number of individuals, and is expensive to transfer

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Classification of knowledge

- Technically specific knowledge is deep knowledge about a specific area
- Contextually specific knowledge refers to the knowledge of particular circumstances of time and place in which work is to be performed

Classification 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.

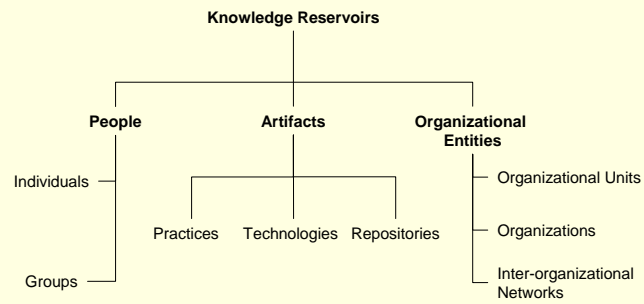
Knowledge and expertise

- Expertise can be defined as knowledge of higher quality
- An “expert” is one who is able to perform a task much better than others

Types of expertise

- Associational Expertise
 - Associating the observations of the performance of a tv to specific causes based on experience; without having deep technical understanding of how a tv works
- Motor Skills Expertise
 - Physical instead of cognitive: riding a bicycle, hitting a baseball, snow skiing downhill, etc.
- Theoretical (Deep) Expertise
 - Deep knowledge of the domain; ability to solve problems not seen before

Reservoirs of knowledge

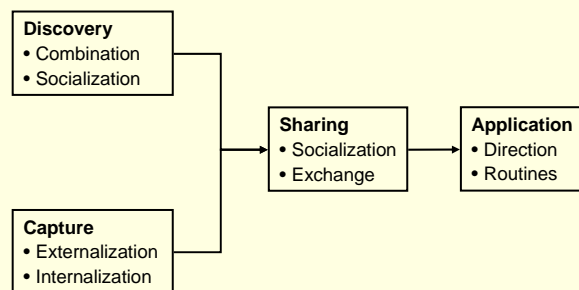


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KM processes



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Knowledge discovery

- Knowledge discovery may be defined as the development of new tacit or explicit knowledge from data and information or from the synthesis of prior knowledge
- Combination
 - Explicit knowledge; re-using existing knowledge in a new context, ...
- Socialization
 - Tacit knowledge; joint activities, information exchange, ...

Knowledge capture

- Knowledge capture is defined as the process of retrieving either explicit or tacit knowledge that resides within people, artifacts, or organizational entities
- Knowledge captured might reside outside the organizational boundaries, including consultants, competitors, customers, suppliers, and prior employers of the organization's new employees

Externalization and internalization

- Externalization involves converting tacit knowledge into explicit forms such as words, concepts, visuals, or figurative language
- Internalization is the conversion of explicit knowledge into tacit knowledge. It represents the traditional notion of “learning”

Knowledge sharing

- Knowledge sharing is the process through which explicit or tacit knowledge is communicated to other individuals
- Effective transfer
- Actual knowledge is shared and not recommendations based on knowledge
- It may take place across individuals, groups, departments or organizations

Direction and routines

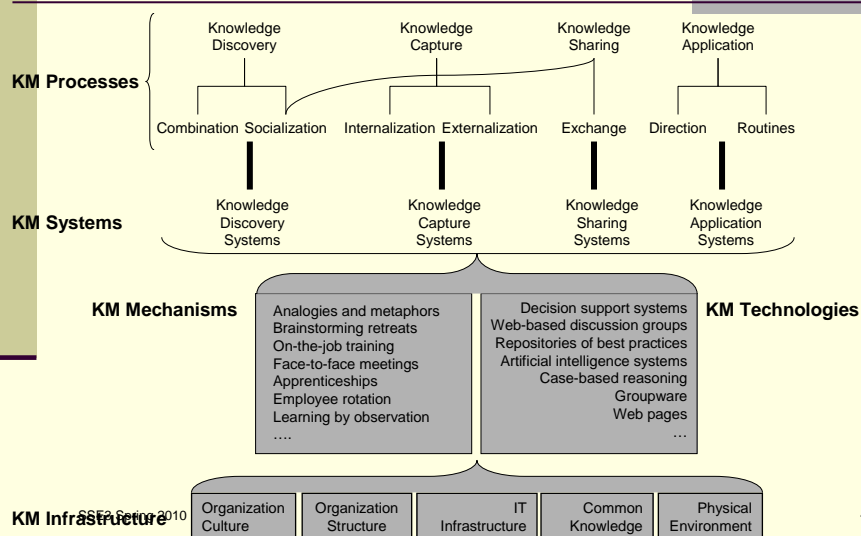
- Direction refers to the process through which individuals possessing the knowledge direct the action of another individual without transferring to that person the knowledge underlying the direction
- Routines involve the utilization of knowledge embedded in procedures, rules, and norms that guide future behavior

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Overview of KM solutions



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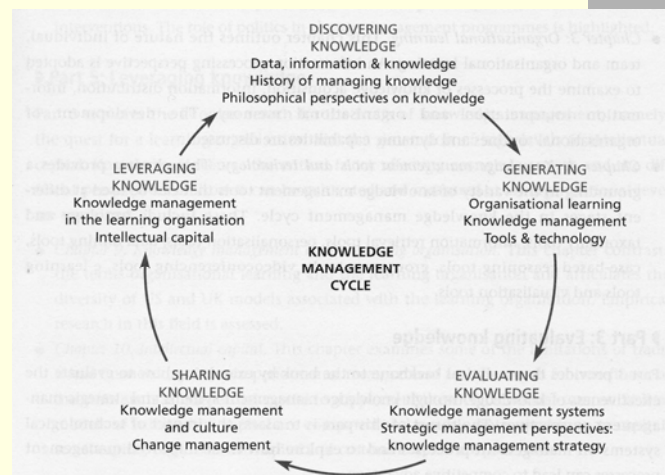
KM infrastructure

Dimensions of KM Infrastructure	Related Attributes
Organization Culture	Understanding of the value of KM practices Management support for KM at all levels Incentives that reward knowledge sharing Encouragement of interaction for the creation and sharing of knowledge
Organization Structure	Hierarchical structure of the organization (decentralization, matrix structures, emphasis on "leadership" rather than "management") Communities of practice Specialized structures and roles (Chief Knowledge Officer, KM department, traditional KM units)
Information Technology Infrastructure	Reach Depth Richness Aggregation
Common Knowledge	Common language and vocabulary Recognition of individual knowledge domains Common cognitive schema Shared norms Elements of specialized knowledge that are common across individuals
Physical Environment	Design of buildings (offices, meeting rooms, hallways) Spaces specifically designed to facilitate informal knowledge sharing (coffee rooms, cafeterias, water coolers)

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Another view on the KM cycle



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Figure 1.1 Knowledge management cycle

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Course perspective on KM

■ Claim

- Most (if not all) public and private companies (organizations) perform KM work
 - Individual settings, collaborative settings
- Currently, some of their KM processes may be supported by software tools
- Most organizations could benefit from additional software tools to manage their knowledge based on an overall understanding of their core KM processes

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Course perspective on KM

- Many, many different types of software technologies can be used for KM
- This course focuses on a few of them
 - Computer supported cooperative work (CSCW) – how can we deal with the complexity of multiple collaborating users in relation to KM processes?
 - Hypertext – how can we deal with the complexity of (data, information, and knowledge) structuring in relation to KM processes?

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Course perspective on KM

- Hypertext
 - Concepts, technologies, systems (apps)
- CSCW
 - Concepts, technologies, systems (apps)
- Also some focus on open systems
 - Integration of software tools
 - Interoperability of software tools
- in relation to hypertext

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Course perspective on KM

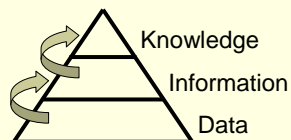
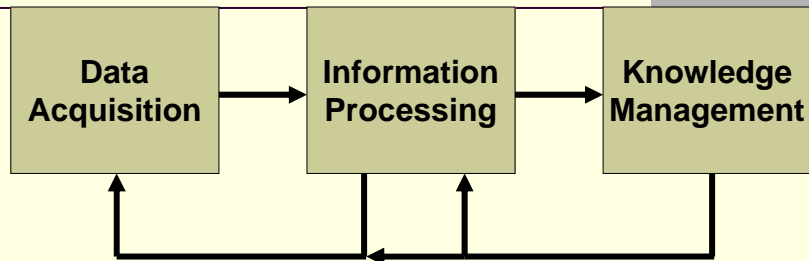
- Example from “*intelligence analysis*”
 - KM processes, sub-processes
- The Maersk Mc-Kinney Moller Institute hosts the *Counterterrorism Research Lab*
 - Uffe Kock Wiil
 - Nasrullah Memon
 - Several other people including PhD and master students

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KM for intelligence analysis



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Knowledge Management Processes

Data → Information → Knowledge

Acquiring Data
from Open Source
Databases

Harvesting Data
from the Web

Other Sources

Processing Data

Mining Data

Defining Patterns

Evaluating
Knowledge

Visualizing

Interpreting

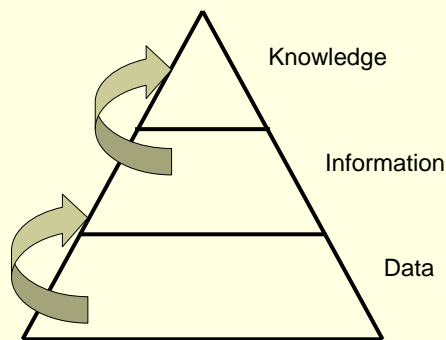
Analyzing

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Can you think of other examples?



Course perspective on KM

- Focus of the course
 - Ability to understand and analyze the existing work processes and workflows of organizations to enable new ways to support, optimize, or automate their work by developing dedicated software tools for KM

Course perspective on KM

- Project revisited
 - Analyze and describe a KM problem
 - Identify overall KM processes
 - Identify KM sub-processes
 - Identify workflows
 - Design a solution for a part of the KM processes and workflows
 - Involve Hypertext and/or CSCW theory
 - Construct a proof of concept prototype