Outline

• Knowledge
• Knowledge Management (KM)
• KM Technologies
• KM Cases
# Data

<table>
<thead>
<tr>
<th>Data</th>
<th>Raw, unprocessed record of an aspect of an event</th>
<th>A particular sale of a particular item on a particular day</th>
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## Data vs. Information

<table>
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<td>Processed data</td>
<td>Daily sale of a particular item</td>
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# Data vs. Information vs. Knowledge

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<tr>
<td><strong>Information</strong></td>
<td>Processed data</td>
<td>Daily sale of a particular item</td>
</tr>
<tr>
<td><strong>Knowledge</strong></td>
<td>Actionable information (Drucker)</td>
<td>Daily sale of a particular item has been increasing steadily for the past six months, and…</td>
</tr>
</tbody>
</table>
Knowledge as Actionable Information

• What are needed for information to be actionable?
  – Experience
    • Improves judgment
  – Values, assumptions, beliefs
    • Color judgment
  – More knowledge
    • What to do, and when and how to do it
Kinds of Knowledge

<table>
<thead>
<tr>
<th>Declarative</th>
<th>Procedural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schemas</td>
<td>Strategies</td>
</tr>
<tr>
<td>Concepts</td>
<td>Rules</td>
</tr>
<tr>
<td>Facts</td>
<td>Procedures</td>
</tr>
</tbody>
</table>

- Episodic or generalized
- Common sense or specialized
- Surface (textbook) or deep
- Tacit (90%, Grant) or explicit (Polanyi)
Examples of Knowledge

- Knowledge of a particular job such as how to elicit and specify user requirements, or how to teach computer programming
- Knowledge of a good way, if not the best way, to do a particular task
- Knowledge of how to solve a problem
- Knowledge of who knows what in a company
Examples of Knowledge (cont.)

- Knowledge of how to put together a team that can achieve a particular task
- Knowledge of how to get things done in a company
- Knowledge of a particular customer account
- Knowledge of a country and its business customs
How Important is Knowledge?

Try removing all the examples of knowledge just listed from your organization. Will it survive?
Basic Knowledge Life Cycle

Knowledge Creation

Knowledge Transfer

Knowledge Use
Knowledge Management

KM is the management of the knowledge life cycle.

Knowledge Creation → Knowledge Transfer → Knowledge Use
Organizational Knowledge Creation (Nonaka)

FROM Tacit TO Explicit

<table>
<thead>
<tr>
<th>Tacit</th>
<th>Explicit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socialization</td>
<td>Externalization</td>
</tr>
<tr>
<td>Internalization</td>
<td>Combination</td>
</tr>
</tbody>
</table>
Direct Knowledge Transfer
(Personalization KM Strategy)

Knowledge Creation

Knowledge Transfer (Direct)

Knowledge Use

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Indirect Knowledge Transfer (Codification KM Strategy)

Knowledge Creation

Knowledge Transfer (Indirect)

Knowledge Use

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## Codification vs. Personalization

*(Hansen, et al.)*

<table>
<thead>
<tr>
<th>How is knowledge communicated?</th>
<th>Codification</th>
<th>Personalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees refer to documents or databases containing codified knowledge</td>
<td>Knowledge is transferred person-to-person</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Role of IT</th>
<th>Connect people across enterprise with codified knowledge</th>
<th>Connect people through communication tools</th>
</tr>
</thead>
</table>

| Typical team structure demographics | Large teams; most members are junior-level | Junior employees not an inordinate proportion of team |
# Mechanisms for Creating Connections (Skyrme & Amidon)

<table>
<thead>
<tr>
<th></th>
<th>Temporary/Flexible</th>
<th>Permanent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Formal</strong></td>
<td>Office layout</td>
<td>Building design</td>
</tr>
<tr>
<td></td>
<td>Multi-function teams</td>
<td>Reward systems</td>
</tr>
<tr>
<td></td>
<td>Collocation</td>
<td>Training and development</td>
</tr>
<tr>
<td></td>
<td>Secondment, job rotation</td>
<td>Formal knowledge bases</td>
</tr>
<tr>
<td><strong>Informal</strong></td>
<td>E-mail</td>
<td>Intranet</td>
</tr>
<tr>
<td></td>
<td>Meeting areas</td>
<td>Professional networks</td>
</tr>
<tr>
<td></td>
<td>Meetings, events</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Communities of practice</td>
<td></td>
</tr>
</tbody>
</table>
Categories of IT Tools for KM Support

1. Computer-Mediated Communication (CMC) tools
2. Content/Document Management systems
3. Problem Solving tools
4. Intelligent Agents
5. Mining tools
6. Portals

will most likely use Artificial Intelligence (AI)
CMC Tools

Typical tools:
- Asynchronous communication tools
  - E-mail
  - Discussion forums
- Synchronous communication tools
  - Chat
  - Conferencing tools
- Digital whiteboards
Content Management Systems

Components:

- Authoring and editing
- Versioning and tracking
- Searching and filtering
- (Categorizing)
- (Screening)
- (Mining)
Problem Solving Tools

Examples:
- Expert Systems
- Decision Support Systems
Expert System Architecture

User interface may employ:
- question-and-answer,
- menu-driven,
- natural language, or
- graphics interface styles

Knowledge-base editor

Inference engine

Explanation subsystem

General knowledge base

Case-specific data

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Expert System Sample
Session with MYCIN

1) Please enter information about the patient.
   Name: Sally
   Age: 42 years
   Sex: Female
   Race: Caucasian

2) Are there any positive cultures obtained from SALLY?
   No

3) Are there any pending cultures of SALLY?
   Yes

4) Site:
   CSF
Date collected: 3-jun-75
Stain examined? Yes
Method of Collection: (urine, sputum only) N/A

5) Stain of smear: Morph: (type NONE if no organism was seen on the smear) None

...  

MYCIN can make no diagnosis on the basis of laboratory findings, so it then asks about symptoms…

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Expert System Sample Session (cont.)

13) Has SALLY recently had symptoms of persistent headache or other abnormal neurologic symptoms (dizziness, lethargy, etc.)?
Yes

14) Has SALLY recently had objective evidence of abnormal neurologic signs (nuchal rigidity, coma, seizures, etc.) documented by physician observation or examination?
Yes

The CSF cultures will be considered to be associated with MENINGITIS.
34) Is the meningitis a hospital-acquired infection? No

35) Is SALLY's clinical history consistent with EPIGLOTTITIS? No

36) Is SALLY's clinical history consistent with OTITIS-MEDIA? No

37) Has the patient ever been to an area that is endemic for coccidiomycoses? Unknown

38) Is SALLY a burn patient? Why
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Expert System Sample Session (cont.)

[i.e. WHY is it important to determine whether SALLY has been seriously burned?]

[4.0] This will aid in determining the organisms (other than those seen on cultures or smears) which might be causing the infection.

It has already been established that
[4.1] the infection which requires therapy is meningitis, and
[4.2] organisms were not seen on the stain of the pending csf culture (CULTURE- 1), and
[4.3] the type of the infection may be bacterial

Therefore, if [4.4] SALLY has been seriously burned then there is suggestive evidence that Pseudomonas-aeruginosa is one of the organisms (other than those seen on cultures or smears) which might be causing the infection [RULE578]

[back to question 38 . . .]

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[back to question 38 . . .]

How 4.3

[i.e. HOW was it established that the type of the infection may be bacterial?]

The following rules concluded about: the likelihood that the type of the infection may be bacterial

Rule Yes No
[4.5] RULE500 (.4)
[4.6] RULE501 (.17)
[4.7] RULE502 (.1)
[4.8] RULE524 (.42)
[4.9] RULE504 (.28)

Thus, it has been established that the type of the infection may be bacterial.
We rejoin MYCIN several questions later as it reports its conclusions about the culprit organisms and then turns to the final phase of its consultation.

My therapy recommendations will be designed to treat for organisms that either are very likely or, although less likely, would have a significant effect on therapy selection if they were present. It is important to cover for the following probable infection(s) and associated organism(s):

INFECTION-1 is MENINGITIS
+ <ITEM-1> MYCOBACTERIUM-TB [from clinical evidence only]
+ . . . COCCIDIOIDES [from clinical evidence only]
+ . . . CRYPTOCOCCUS [from clinical evidence only]
43) Does SALLY have a clinically significant allergic reaction to any antimicrobial agent?
No

[Considering ETHAMBUTAL-AND-INH-AND-RIFAMPIN for use against INFECTION-1 . . .]

44) Is SALLY pregnant or breast feeding?
No

45) Do you have reason to suspect that SALLY may have impaired renal functions?
No

46) SALLY’s weight in kilograms (or <number> POUNDS):
51.3
[REC-1] My preferred therapy recommendation is as follows: Give the following in combination:

1) ETHAMBUTAL
Dose: 1.289 (13.0 100mg-tablets) q24h PO for 60 days [calculated on basis of 25 mg/kg] then 770 mg (7.5 100mg-tablets) q24h PO [calculated on basis of 15 mg/kg]
[The dose should be modified in renal failure. One can adjust the dose only if a creatinine clearance or a serum creatinine is obtained.]
Comments: Periodic vision screening tests are recommended for optic neuritis.

2) INH
Dose: 513 mg (5.0 100mg-tablets) q24h PO [calculated on basis of 10 mg/kg]
3) RIFAMPIN
Dose: 600 mg PO q24h
Comments: Administer dose on an empty stomach.

Although I suspect that fungus may be a possible pathogen, in the absence of definitive evidence I will not recommend antifungal therapy at this time. Please obtain samples for fungal, TB, and viral cultures, cytology, VDRL (blood and CSF), cryptococcal antigen (blood and CSF), viral titers (blood and CSF). An infectious disease consult may be advisable.
Intelligent Agents

Typical Tasks:

– User profiling, modeling,
– Providing services to users, e.g.:
  • Making arrangements (e.g., meetings, travel)
  • News filtering
  • Training
– Performing transactions on behalf of users, e.g.:
  • Negotiating
  • Purchasing (e.g., stocks)
CONCAT (Chan et al.)

- A CCS undergrad thesis project that schedules meetings using intelligent agents
CONCAT’s Agents’ 4-Step Negotiation Process

**Step 1: Initiator**

- find time interval
  - no time available → fail
  - no invitee
- send out proposal to invitees → schedule meeting

**Step 2: Responder**

- receive proposal
  - empty?
    - send reject bid
  - find local solution → send back bid
CONCAT’s Agents’ 4-Step Negotiation Process (continued)

step 3: Initiator
- collect bids from invitee
- evaluate bids of invitee
- common free time
- send award to bidders
- no common free time
- generate new proposal
- send out proposal

step 4: Responder
- receive proposal
- receive awards
- check time interval
  - free?
    - schedule meeting
    - send reject
  - not free?
    - go back to step 2

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Mining Tools

What can be mined?

- Data warehouses (structured data)
- Collections of documents (unstructured data)
- E-mails, chat logs (unstructured data)
- World Wide Web (semi-structured data)
Data Mining Example

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Data Mining Example (cont.)

This association rule was discovered in Walmart’s data. (Urban legend?)

Plausible explanation: Maybe mom phoned dad to buy some diapers, and dad bought beer as well?

What Walmart did: Place diapers and beer closer to each other, and put items in between to boost their sale.
Portals

Functions and features

- Single-point access to all relevant documents, applications, and databases, plus all of the aforementioned KM tools
- Yellow pages
- Security
- Personalization
KM Pyramid (Rosenberg)

Level 1: Document Management
Documents stored online;
Online access & retrieval
Simple CMS and portals

Level 2: Information Creation, Sharing, and Management
Capturing & distributing expert stories;
communication & collaboration
CMC tools (esp. chat, forums, whiteboards),
More advanced portals/CMS (w/ screening)

Level 3: Enterprise Intelligence
Building expert networks;
performance support
Problem solving systems, Intelligent agents,
CMC tools, More advanced CMS (w/ mining),
Advanced portals

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Mapping the Tools to the Knowledge Life Cycle

1. CMC tools
2. CMS/DMS
3. ES/DSS
4. Intelligent Agents
5. Mining Tools

Knowledge Creation

Socialization, Externalization

Externalization, Combination

Knowledge Transfer

Codification

Personalization

Knowledge Use

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Greatest Obstacles

• Culture
• Relationships
In other words… people issues.

A solution:
• Communities of practice
Communities of Practice
(Wenger)

Communities of practice…

– are groups of people
– who share a concern, a set of problems, or a passion about a topic, and
– who deepen their knowledge and expertise in this area
– by interacting on an ongoing basis
Interestingly…

- we all belong to a number of them – at work, at school, at home, in our hobbies
- some have a name, some don’t
- some we recognize, some remain largely invisible
- in some we are core members; in others, occasional participants
- some are small; some, big
- some are long-lived, some, short-lived
- some are colocated; some, distributed
- some are homogeneous; some, heterogeneous
- some are unrecognized; some, institutionalized
Three Fundamental Elements

1. Domain
   - Denotes the common ground (topic, problems, concerns) of a community
     • same profession
     • same job or role
     • same clients
     • face similar problems not officially recognized as domains
   - Creates a sense of common identity
Three Fundamental Elements (cont.)

– Knowledge of the boundaries and leading edge of the domain enables members to
  • decide what is worth sharing and
  • recognize the potential in tentative or half-baked ideas
Three Fundamental Elements (cont.)

2. Community

- Creates the social fabric of learning
- Fosters interactions and relationships based on mutual respect and trust
- Encourages a willingness to
  - share ideas,
  - expose one’s ignorance,
  - ask difficult questions, and
  - listen carefully
Three Fundamental Elements (cont.)

3. Practice

– Set of frameworks, ideas, tools, information, styles, language, stories, best practices, documents that community members share

– The specific knowledge the community develops, shares and maintains

– When a community has been established for some time, members expect each other to have mastered the basic knowledge of the community
Three Fundamental Elements (cont.)

• This enables the community to proceed efficiently in dealing with its domain
Stages of Community Development (Organizational Setting)

1. Potential
2. Coalescing
3. Maturing
4. Stewardship
5. Transformation
Stage 1: Planning

Typical work plan

– Determine the primary intent of the community
  • Helping
  • Best-practice
  • Knowledge-stewarding
  • Innovation

– Build a case for action

– Identify potential coordinators and thought leaders
Stage 1: Planning (cont.)

– Interview potential members
– Connect community members
– Create a preliminary design for the community
  • Scope
  • Hot topics
  • Structure
  • Roles
  • Knowledge-sharing process
  • Names of key members
Stage 2: Coalescing

Typical work plan

– Build a case for membership
– Launch the community
  • Dramatic
  • Quiet
– Initiate community events and spaces
  • Regular events are the heartbeat of the community
  • Spaces create a sense of familiarity
  • Rituals establish a routine
Stage 2: Coalescing (cont.)

– Legitimize community coordinators
– Build connections between core group members
– Find the ideas, insights and practices that are worth sharing
– Document judiciously
– Identify opportunities to provide value
– Engage managers
Stage 3: Maturing

Typical work plan

– Identify gaps in knowledge and develop a learning agenda
– Define the community’s role in the organization
– Redefine community boundaries
– Routinize entry requirements and processes
Stage 3: Maturing (cont.)

– Measure (or demonstrate) the value of the community

– Maintain a cutting-edge focus
  • This depends on the commitment and stature of the core group

– Build and organize a knowledge repository
Stage 4: Stewardship

Typical work plan

– Institutionalize the voice of the community
– Rejuvenate the community
– Hold a renewal workshop
– Actively recruit new people to the core group
– Develop new leadership
Stage 4: Stewardship (cont.)

– Mentor new members
– Seek relationships and benchmarks outside the organization
Stage 5: Transformation

Communities transform themselves in many ways:

– Many simply fade away
– Some die by turning into a social club
– Some split into distinct communities or merge with others
– Some require so many resources that they become institutionalized (e.g., they become centers of excellence or actual departments)
Case Studies

• Trend Micro Philippines
• Intel Philippines
Trend Micro Philippines

• Trend Micro
  – A market leader in network and PC security

• Trend Micro Philippines
  – Provides tech and KM support, among others

• KM initiative:
  – SolutionBank
    • In 2004, contained 18000 solutions
    • 6.9 million hits have been recorded, with an estimated USD5.2 million cost savings
Intel Philippines

• Intel
  – Market leader in semiconductor design and manufacture

• Intel Philippines
  – Manufacturing plants established in 1974 and 1996

• KM initiatives
  – Best Known Method (BKM) and Copy Exactly!
    • Sophisticated process of best practice development and transfer

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