KNOWLEDGE ON DEMAND:
Knowledge and
Expert Discovery

Dr. Mark T. Maybury
Executive Director
Information Technology Division

I-KNOW Conference
Graz, Austria
12 July 2002

www.mitre.org/resources/centers/it
Knowledge on Demand

0 Knowledge Management Strategy
0 Knowledge Extraction and Discovery
   - IntelGazette, BNN, AQUAINT, TIDES, GeoNODE
0 Expert and Expert Community Discovery
   - ExpertFinder, XperNET
0 Facilitating Group Knowledge Creation
   - KEAN, OWL
0 Facilitating Knowledge Communication/Exchange
   - CVW, TrIM
0 Conclusion
Why KM?
Change is Accelerating

![Graph showing doubling times for various technologies and .COM storage requirements.]

- Optical Network Speed doubles every 8 months
- Storage capacity doubles every 12 months
- Computing power doubles every 18 months

Some .COM storage requirements double every 90 days

Source: EMC
Speed Is Increasing (at least in the US)

- On TV alone From 1965 to 1995:
  - Ads shrunk from 53 seconds to 25 seconds
  - News soundbites dropped from 42 to 8 seconds
  - Number of ads per minute increased from 1.1 to 2.4

- In 1971 Americans were targeted by 561 ads daily
  - By 1991, 3000 ads competed for Americans’ attention
  - The Web will increase this amount exponentially

Use of Ritalin up 700% since 1990

Source: Tom Davenport and John Beck
Knowledge Growth

Number of Patents to US Residents, 1981-2001
Knowledge Growth

Types of Patents to US Residents, 1981-2001

- Utility: chemical, electrical, and mechanical
- Design
- Plant
- Reissue
- Total
Amazon Buying Circles: Austrian Favorites

9. First, Break All the Rules: What the World's Greatest Managers Do Differently by Marcus Buckingham
7. Leading the Revolution
5. Inside C# (With CD-ROM)
4. The Sixteenth Round: From Number 1 Contender To #45472
3. The Value Reporting Revolution: Moving Beyond the Earnings Game
2. XSLT Programmer's Reference
1. GPRS and 3G Wireless Applications: Prof. Developer's Guide
What is KM? An Enterprise Perspective

The strategies, processes, and technologies employed to enable an enterprise to acquire, create, share, and make actionable the knowledge needed to achieve mission objectives
Framework
KM Enablers
Knowledge-Enabled Outcome States

**State 0**
Where We Were
- Ad Hoc Processes
- Local Initiatives
- Disparate Views of Resources
- Low Tool Standardization
- Collaboration Valued

**State 1**
Fostering Knowledge Development
- Common KM Understanding
- Center Pilots
- Consolidated Resource View
- Greater Tool Standardization
- Knowledge-Sharing

**State 2**
Harvesting the Benefits
- KM Targets
- Enterprise Processes
- Knowledge Discovery
- Tool/Process integration
- Knowledge Creation and Re-use Impact

**State “V”**
Ultimate Vision
- Embedded KM
- Known Knowledge Value
- Pervasive Infrastructure
- Innovative Outcomes
APQC Model of Stages of KM Implementation

STAGE 1: Enter and Advocate
- Develop interest and enthusiasm
- No formal business case; belief in the value
- Define KM in terms people understand
- Capitalize on intranet
- Understand organizational readiness

STAGE 2: Explore and Experiment
- Select pilots or identify grass root efforts
- Business objectives are specific to pilots
- Form a cross-functional KM task force

STAGE 3: Discover and Conduct Pilots
- Support pilots
- Business case is potential gain from pilots
- Share pilot lessons learned
- Develop methodologies that can be replicated

STAGE 4: Expand and Support
- Scale up; build capability
- Business case and measures become more formal
- KM coordination team
- Identify roles and resources for the KM function
- Establish awards and recognition

STAGE 5: Institutionalize
- KM embedded in business model
- Organizational alignment
- Project work with activity and knowledge base support
- Standards

Way of doing business

Pilot Path

Strategic Pilots
Opportunistic Pilots
## KM Portfolios of KM Best Practice Companies (APQC, 2000)

### Elements Central to KM Approach: Intranet, CoP/Networks, Best Practice Publication

<table>
<thead>
<tr>
<th></th>
<th>Resource</th>
<th>Communications</th>
<th>Collaboration</th>
<th>Work Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>MITRE</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Xerox</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>World Bank</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Chevron</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Seimens</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>HP Consulting</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

**Resource Tool (Pull)** - Yellow Pages, Best Practice DBs, Search Engines

**Collaboration** - Access to knowledgeable human resources

**Communications** - e-mail, Web pages

**Work Application** - Project Management, Problem Solutions, Customer Service
Collaborative Virtual Workplace (cvw.sourceforge.net)
KM and Information Technology Lessons learned (APQC, 2000)

- Changing Role - KM not a IT initiative but works with the KM Team to enable knowledge sharing
  - HP Consulting - would not start with technology if they could start again
  - Siemens - moved from a focus on IT implementation tools to a sociotechnical focus by providing support tools for KMS
  - World Bank - originally in the IT organization, then moved to operations
  - Chevron - filling critical gaps with the expertise directory, easy-to-use community of practice tools and launch processes, and Web search and retrieval tools
Process

Knowledge Requirement

Expertise & Knowledge Discovery

Knowledge Team Formation

KNOWLEDGE INFORMATION INFRASTRUCTURE (KII)

Customer(s)

Knowledge Delivery

Knowledge Creation
Knowledge Management Capability Maturity Model (KM CMM)

**KM Goal State:** An enterprise is acquiring, creating, sharing, and protecting knowledge that it needs to take action to achieve business objectives.

**Level 5: Optimizing**
- Business process alignment
- Process change management

**Level 4: Managed**
- Integrated knowledge processes
- Quantitative process management

**Level 3: Defined**
- Organizational processes
- Knowledge mapping
- Intergroup coordination
- Training program

**Level 2: Repeatable**
- Program planning
- Requirements process
- Content QA process
- KFP identification

**Level 1: Initial**
- Adhoc processes
- Partial technical infrastructure
# KM Capability Maturity Model (KM-CMM)

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>STRATEGY POLICY</th>
<th>PROCESS</th>
<th>CONTENT</th>
<th>TECH</th>
<th>CULTURE</th>
<th>BENCHMARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Optimizing</td>
<td>optimized aligned</td>
<td>best practice reviewed</td>
<td>optimized integrated</td>
<td>pervasive automatic</td>
<td>shared intent joint work</td>
<td>optimized standard</td>
</tr>
<tr>
<td>4. Managed</td>
<td>goals planning</td>
<td>trained published</td>
<td>defined KFP</td>
<td>semi-aut</td>
<td>Awareness</td>
<td>measured</td>
</tr>
<tr>
<td>3. Defined</td>
<td>none</td>
<td>published adhoc</td>
<td>mapped quality ass.</td>
<td>partial</td>
<td>limited aware</td>
<td>published</td>
</tr>
<tr>
<td>2. Repeatable</td>
<td>none</td>
<td>best practice reviewed</td>
<td>optimized unorganized</td>
<td>manual</td>
<td>partial</td>
<td>none</td>
</tr>
<tr>
<td>1. Initial</td>
<td>none</td>
<td>published adhoc</td>
<td>unorganized</td>
<td>partial</td>
<td>limited aware</td>
<td>none</td>
</tr>
</tbody>
</table>
KM CMM elements

0 Certification of KM practitioners. See report at http://icasit.org/km/kmrt/feb01/index.htm

0 Measurement of KM activity and behaviors

0 Formal and visible incentives for KM, e.g.,
   - KM Awards Program initiated at MITRE
   - Best Paper award in collaboration with Int. J. of KM
Knowledge on Demand

- Knowledge Management Strategy
- Knowledge Extraction and Discovery
  - IntelGazette, BNN, AQUAINT, TIDES, GeoNODE
- Expert and Expert Community Discovery
  - ExpertFinder, XperNET
- Facilitating Group Knowledge Creation
  - KEAN, OWL
- Facilitating Knowledge Communication/Exchange
  - CVW, TrIM
- Conclusion
 Typed Query: Where was Ebola last reported in animals and humans on the coast of Gabon?

Multimodal Query: Where was Ebola last reported near this coast (spoken with gesture to map)?

BBC News. Friday, 11 January, 2002, 16:37 GMT
Ebola in Gabon
A World Health Organisation official, Gregory Hartl, expressed concern about 200 people who had been in contact with Ebola victims near Mekambo, a jungle town about 750 kilometres (465 miles) north-east of the capital, Libreville. There have been 34 confirmed cases reported so far, including 25 deaths - 18 in Gabon and seven in the Republic of Congo. Another 200 people are being closely monitored.

Multimodal Answer: 25 people died of Ebola in Gabon and Congo as of January 11 near the location shown here in the map

Fused, Tailored Multimodal Answers

Vision: Ask Questions, Get Answers

Text Documents, not Answers
Knowledge Discovery Tools

Sources

Collect

Disseminate/Retrieve
(TIDES, QANDA)

Extract
(Alembic)

Summarize
(WebSumm)

Translate
(CyberTrans)

Cluster/Mine
(IntelGazette, QueryFlocks)

Collaborate
(CVW, TrIM, KEAN, ExpertFinder, XperNET)

Monitor
(SIAM)

Browse/Visualize
(GeoNODE)

Finance
Energy
Trans.
Telecomm
Z-Ave

Disseminate/
Retrieve
(TIDES, QANDA)

Extract
(Alembic)

Summarize
(WebSumm)

Translate
(CyberTrans)

Cluster/Mine
(IntelGazette, QueryFlocks)

Collaborate
(CVW, TrIM, KEAN, ExpertFinder, XperNET)

Monitor
(SIAM)

Browse/Visualize
(GeoNODE)
# IntelGazette - Topic Clustering and Labeling

Automatic topic clustering generates daily and weekly news summaries, links related stories across time and news sources.

## Gazette Sources

<table>
<thead>
<tr>
<th>Source</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABCNews.com</td>
<td>ABCNEWS.com, established May 13, 1999, is one of the fastest growing news sites on the Internet. With editorial and technical resources from ABC News and The Walt Disney Internet Group, ABCNEWS.com consistently provides users with up-to-the-minute, engaging, informative and interactive coverage of a range of issues and events.</td>
</tr>
<tr>
<td>Associated Press</td>
<td>Founded in 1848, the Associated Press is the oldest and largest news organization in the world, serving as a source of news, photos, graphics, audio and video for more than 1,200 people a day.</td>
</tr>
<tr>
<td>International Herald Tribune</td>
<td>Determined maverick and opinion leader, the International Herald Tribune is the most complete, credible and concise daily briefing on world affairs and events around the world. The IHT is published in Paris and read in every country on earth.</td>
</tr>
<tr>
<td>L.A. Times</td>
<td>The Los Angeles Times published its first edition in 1881 under the name of the Los Angeles Daily Times. The newspaper's two original founders ran out of money, and the fledgling paper was inherited by its printer, the Mirror Printing Office and Book Bindery. The Mirror Company promptly began publishing the Times, which could hire relatively cheap labor. They hired former military office Horace Greeley, who took the job, drew the paper and turned it into a financial success. His and another publisher, the Times Mirror Company, Two years later, Osha bought out his partners.</td>
</tr>
<tr>
<td>Miami Herald</td>
<td>Hard hit. The Miami Herald newspaper was the 4th most linked-to website in the nation. (American Journalism Review). On a monthly basis, the site receives over 300,000 unique Internet users in South Florida and generates up to $40 million page views. The site's local and international news, travel, sports, classified ads and community content are requested by affluent, educated readers who fill the ideal client demographic.</td>
</tr>
<tr>
<td>Reuters</td>
<td>Reuters, the number one source for news online, can turn your site from just one more stop on the world wide web into a destination site. By offering your online customers and web surfeits the latest news and information, you will give them a compelling reason to visit your site over and over again. Our showcases of online products and services the numerous ways that Reuters delivers news and information to the online world. Reuters 1600 years ago.</td>
</tr>
<tr>
<td>Washington Post</td>
<td>A morning and daily newspaper published in Washington, D.C. For the 6-month period ending March 31, 1999, The Post's audited estimated average circulation (ABC Newspaper Publisher's Statement) was 500,000 Monday-Friday and 1,055,520 Sunday. The Post manages 31 foreign, 7 national, and 12 state and news bureaus.</td>
</tr>
</tbody>
</table>
Date: Jul 3rd, 2001 -- [Last updated at 19:00 GMT]

Categories:

**Vivendi Universal; Media Companies; French Water; Universal Music**  
A Vivendi auction might lack big spenders  
- A Vivendi auction might lack big spenders Steve Lohr The New York Times Wednesday, July 3, 2002 Vivendi Universal, the troubled French media giant, is expiring the company up for sale, but any auction is likely to be a low-key affair in

NEWS ANALYSIS For Messier, stumbles led to downfall  
- NEWS ANALYSIS For Messier, stumbles led to downfall Seth Schiesel and John Tagliabue The New York Times Wednesday, July 3, 2002 Jean-Marie Messier announce his resignation Tuesday as chairman of Vivendi Universal SA, failed in his ambition

No break-up,' Vivendi chief pleads  
- No break-up,' Vivendi chief pleads Steven Livingston International Herald Tribune Wednesday, July 3, 2002 PARIS As Jean-Marie Messier prepared Tuesday dawn from the helm of Vivendi Universal SA, he pleaded that the media and entertainment g

United States; International Criminal; Washington Post; Criminal Court  
U.S. won't budge on immunity  
- U.S. won't budge on immunity Thom Shanker and James Dao The New York Times Wednesday, July 3, 2002 Rumsfeld says Americans may avoid peacekeeping

WASHINGTON Defense Secretary Donald Rumsfeld has warned that the United States might not send its

On the backs of Bosnians  

heart hailed as the biggest advance for human rights in a half-century. The celebration is

Heart Disease; Taking Hormones; Blood Clots; Gall Bladder  
Doubts on Hormones, Heart Risk Believed  
- In women with heart disease, taking hormones after menopause does not protect against heart attacks or strokes and increases the risk of dangerous blood clot

bladder disease, according to a major seven-year study released yesterday. In th

Hormone replacement raises heart patients' risk  
- Hormone replacement raises heart patients' risk Susan Okie The Washington Post Wednesday, July 3, 2002 WASHINGTON In women with heart disease, tal

estrone after menopause does not protect against heart attacks or strokes and it increases the risk

Afghan Government; Military Operations; Hospital Wearing; Karzai Called  
Afghan Officials Decry U.S. Airstrike  
- KANDAHAR, AFGHANISTAN, July 2 -- A U.S. air assault in Urgun province early Monday, which local officials said killed 40 civilians and wounded at least 100

the Afghan government's strongest denials to date of U.S. military operations.
Broadcast News Navigator (BNN): “Story Skim” on Text Search of “Diana”
### BNN “Story Detail”

#### Summary

- **Length:** 00:02:11
- **Number Hits:** 6

**CNN Prime News**

There is concern tonight in Washington and around the world about the intentions of Saddam Hussein.

#### Closed Caption

- Saddam Hussein
- Iraq

#### Related Web Sites

- CNN
- State Department
- United Nations

#### Most Frequent Named Entities

- Saddam
- Saddam Hussein
- Steve Hurst
- George Bush

#### Key Frame

- Breaking News Navigator (BNN)

#### Video

- Video content related to the story

#### Source Topics

- Topics and related entities

---

**Project**

- BNN
- Home

**Search BNN by:**

- Browse for Stories
- Search for Stories

**BNN Usage**

- Browse Other Sources

---

**TOPICS**

- Saddam Hussein
- Iraq
Accuracy versus Time

IDEAL

Average Performance
(F-score = (P+R)/2)

Average Time
(seconds per story)

Key Frame

3 Named Entities

All Named Entities

Skim

Topic

Summary

Story Details

Video

Skim and Details
Personalcasting: Tailored News

STORY SKIM

User Query

STORY DETAILS

Story Selection

Explicit Profiles and Presentation Preferences

Interest Model
(keyword, named entities)

Preference Model
(source, date, media, length)

Source/Media Selection

Personal News Dissemination

American capitalists and Cuban communists got together today in an effort to ...
"It is better to ask some of the questions than to know all the answers"

James Thurber
AQUAINT
Advanced QUestion & Answering for INTelligence
“Ask Jeeves” Approach

- Start with Your Question
- Identify Key Words & Classifies the Type of Question
- Respond with rephrased “Questions” for which “Ask Jeeves” knows the Answer
- Provide Additional Web Sites as a fall back position (a la --- a more traditional web search engine)
Question and Answering - QANDA

- Doc collection or the Web
- Semi-structured database
- Relational Database

Knowledge sources
Q and A Engine
User applications

- MII
- IRS hotline operator
- GeoNODE
- BNN

Multiple Knowledge Sources and Multiple Applications

MITRE
Human Science Question Answering

0 How long it takes the Earth to orbit the sun?
   One year. 54% correctly answered

0 Do antibiotics kill viruses as well as bacteria?
   False. 51%

0 Human beings developed from earlier species of animals.
   True, according to the theory of evolution, which is accepted by the majority of scientists, but not by many religious leaders. 53%.

0 The earliest humans lived at the same time as the dinosaurs.
   False. Dinosaurs died off millions of years before humans appeared. 48%.

0 Do lasers work by focusing sound waves?
   False. Lasers focus light. 45%

0 The universe began with a huge explosion.
   True, according to the "Big Bang" theory widely accepted by scientists, but dismissed by some religious leaders. 33%
TREC QA Track Results

- ARDA & DARPA co-sponsoring the Question Answering Track in the NIST’s organized Text Retrieval Conference (TREC) Program. (Starting with TREC-8 in Nov 1999)

- TREC-10 Results (Nov 2001):
  - 500- factual questions; About 50 questions had no answer in the Data sources; Used
  - Data source: approx. 3 GByte ~980K news
  - 36 US & international participated; runs evaluated
  - System output: top 5 regions (50 bytes) in a single story contain Answer question

![QA Track Results-TREC 10 (Nov 2001)](image)

**Top System: 70% of the “Answers” found in their top 5 50-byte Passages**
# Question Answering Characteristics

<table>
<thead>
<tr>
<th>Kinds of QA</th>
<th>Question/Answer Complexity</th>
<th>Source Volume, Quality</th>
<th>Corpus, Resource Model</th>
<th>Answer Integration &amp; Generation</th>
<th>Type of User Query</th>
<th>Type of System Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>TREC Q&amp;A On-line dictionaries, encyclopedias</td>
<td>Moderate Q., Easy A.</td>
<td>small (100s MB), static, high quality source</td>
<td>Encyclopedic technical manuals</td>
<td>easy</td>
<td>FORM: - Keyword(s) - Phrase(s) - Question(s)</td>
<td>- Named entities - Phrase - Factoid - Link to document - Summary</td>
</tr>
<tr>
<td>On line manuals (e.g., UC)</td>
<td>Easy to Moderate Q., Moderate A.</td>
<td>small to high (10 GB), dynamic, variable quality sources</td>
<td>Web</td>
<td>moderate</td>
<td>TYPE: - Who - What - When - Where - How - Why - What-if</td>
<td></td>
</tr>
<tr>
<td>Web QA (e.g., Kiwilogic linguabot, e-Gain mail, Firepond)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multimedia QA</td>
<td>Hard Q., Hard A.</td>
<td>very high, real-time, streaming, dynamic variable quality sources</td>
<td>Varied Multi-linguality (in Response and in Query)</td>
<td>hard</td>
<td>INTENT: - request - command - inform</td>
<td></td>
</tr>
</tbody>
</table>
Research Roadmap of Question Answering 2003-2006

Shared data, problems, test suites, evaluation at milestones

Productive, Quality QA

- Measurable Progress
- Composable Toolkit for QA
- Personalized QA

Methods & Algorithms

- Resource Selection
- Constrained QA (Resource/Solution)
- Stereotypical and Individualized QA
- QA Reuse
- QA as Planning
- Create QA Sets
- Semi-structured Data
- Answer Fusion
- Interoperability
- Quality Assurance

Systems (Performance & Eval)

- Reuse across sessions
- START, FAQFinder, Ionaut, QANDA
- Web Services (e.g., Google API)
- Multisessional QA (including change detection)
- Crosslingual QA
- Multilingual QA
- Temporal QA
- Constrained QA (Resource/Solution)
- Stereotypical and Individualized QA
- QA Reuse
- QA as Planning
- Create QA Sets
- Semi-structured Data
- Answer Fusion
- Interoperability
- Quality Assurance

Evaluation

- User Expectations
- Reuse across sessions
- START, FAQFinder, Ionaut, QANDA
- Web Services (e.g., Google API)
- Multisessional QA (including change detection)
- Crosslingual QA
- Multilingual QA
- Temporal QA
- Constrained QA (Resource/Solution)
- Stereotypical and Individualized QA
- QA Reuse
- QA as Planning
- Create QA Sets
- Semi-structured Data
- Answer Fusion
- Interoperability
- Quality Assurance

Task Model

- Collect QA Logs
- Public Taxonomies (e.g., OpenDirectory in RDF)
- TIMEML “Perspective BANK“ Typology
- USC/ISIS Question Typology
- TREC QA
- trec.nist.gov/data/qa.html

User Typology

- Speed Limit Inference
- Speed Limit Robust NLP
- Requirements Determination
- Feasibility Testing

Related Fields: HPKB, TDT, DB, Virtual Ref Desk, User Modeling

- Why Questions
- Script/Template Answers
- Fact Answers

- How Questions
- Multimodal Questions

- What If Questions

Resources

- Resources (Development, Evaluation)

Copyright © 2002 Mark Maybury
Today is a significant day in the history of our national liberation struggle, it marks the end of a year during which we have resisted and fought against the biggest ever offensive operation launched by the Sri Lankan armed forces code named "Jayasikuru"...

- Liberation Tigers of Tamil Eelam (LTTE)
- Sri Lanka
- Velupillai Pirapaharan
- Rebellion

<table>
<thead>
<tr>
<th>Org</th>
<th>Leader</th>
<th>HQ</th>
<th>Losses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sinhala</td>
<td>Kumaratunga</td>
<td></td>
<td>3000</td>
</tr>
<tr>
<td>LTTE</td>
<td>Pirapaharan</td>
<td>Wanni</td>
<td>1300</td>
</tr>
</tbody>
</table>

The objective of the Sinhala chauvinists was to utilize maximum man power and fire power to destroy the military capability of the LTTE and to bring an end to the Tamil freedom movement. Before the launching of the operation "Jayasikuru" the Sri Lankan political and military high command miscalculated the military strength and determination of the LTTE.
TIDES: Tracking Global Infectious Disease

Automatically generated header, sorted by disease, location, source, date, etc.

Local, private workspace

Documents automatically categorized into shared, tailorable hierarchy

Disease event

Hyperlinked summary

Named-entity tagged text
Geospatial News on Demand (GeoNode)

News Sources:
- Broadcast
- World Wide Web
- Intel. Msg Traffic
- Specialist Archives

GeoNODE Database
- Data Acquisition/Pre-process
- Information Extraction
- Data Mining And Clustering
- Indexing And News Modeling
- Topic Timeline
- News histogram
- Map overview
- BNN Story skim
- \( \text{\textbullet\textbullet\textbullet} \)

- Navigate
- Filter
- Indexed access
- Animate reporting trends
- Create reports/web

MITRE
### Representative Data Mined Topic Clusters

#### From CNN:
- Hebron, Benjamin Netanyahu
- Iraq, Scott Ritter, UNITED NATIONS, Ritter
- China, Jiang, Jiang Zemin
- China, Pakistan, Islamabad, Jamie McIntyre, India
- Sosa, Roger Maris, Sammy Sosa, St. Louis, Mark McGwire
- Denver, Tony Clark, Timothy McVeigh, Terry Nichols, Susan Candiotti, Oklahoma City

#### From Monterey Abstracts:
- Agni, Organisation, Prithvi, Indian Army, Defence Research, DRDO
- ICBM, Plesetsk
- Approval, MTOPS, Computer Decontrol
- Arianespace, Soyuz, Starsem, Samara, Plesetsk Cosmodrome
- Belarus, Soviet Union, SS, Kazakhstan, ICBMs, ICBM
- Armenia, Georgia

#### Evaluation on TDT Corpus:
- Evaluation on TDT Corpus (6 months of print, video, and radio, 65,583 documents, 100 topics manually identified over 6941 documents)
- Last two months detected 80% of human-defined topics, 83% of stories within human-defined topics, misclassified 0.2% of stories
The Web Has Gone Multilingual

0 Last year, the web became more than 50% non-English
0 Only 15% of Europe's half a billion population speaks English as a first language
0 Only 28% speaks English at all
0 Only 32% of Web surfers on the European continent consult the Web in English. [Source: Global Reach: www.euromktg.com/eng/GR/]
0 45% of Internet users from non English-speaking countries
0 By 2002, analysts estimate that 66% of Internet use and 40% of e-commerce revenue will come from outside the U.S. [Source: IDC]
0 300,000 Japanese patents filed annually

"If I'm selling to you, I speak your language. If I'm buying, dann müssen Sie Deutsch sprechen”

Willy Brandt, former German chancellor
Open Source Analysis of Latin America

Event Timeline

• 10 Mar 98: Pinochet resigns
• 17 Mar 98: Cuban defector, pitcher Orlando Hernandez
• 15 Apr 98: Execution of Paraguayan Angel Breard, convicted killer in US
• 21 Apr 98: Plane crash: Bogota, Columbia to France
• 17 Oct 98 - 27 Oct 98: Pinochet's arrest by Scotland yard while getting medical treatment
• 26 Oct 98: House of Lords deny Pinochet diplomatic immunity
• 28 Nov 98: Columbian man surrenders near Bogota, accused of shooting DEA Agent Moreno
• 04 Dec 98: Iranian Woman has been charged by Argentina's Supreme Court for the 1992 bombing of Israeli embassy in Buenos Aires, Argentina
• 07 Jan 99 - 18 Jan 99: Brazilian Financial crisis
GeoNODE UI over 9 Months of Colombian Newspaper El-Espectador
National Liberation Army (ELN) Topic Cluster Viewed in geospatial context
Drill Down to Reports in the ELN Topic Cluster
Story About Human Rights Violations

El Espectador Story Skim

F.M. denuncian a Farc ante los E.U.
Bogotá y Washington.
1999-07-12 08:32:20.0

Se disparan homicidios colectivos en Colombia
Bogotá
1999-07-12 08:32:00.0

Ejercito: m?s bajas en la guerrilla
Bogotá
1999-07-12 08:31:00.0

El "gran plan de fuga" de las Farc
Bogotá
1999-07-06 08:31:00.0

Confusa espera en la liberacin de secuestrados
Knowledge on Demand

0 Knowledge Management Strategy
0 Knowledge Extraction and Discovery
   - IntelGazette, BNN, AQUAINT, TIDES, GeoNODE
0 Expert and Expert Community Discovery
   - ExpertFinder, XperNET
0 Facilitating Group Knowledge Creation
   - KEAN, OWL
0 Facilitating Knowledge Communication/Exchange
   - CVW, TrIM
0 Conclusion
Expert Discovery

0 Find global Experts
  - quick
  - accurate
  - comprehensive

0 Challenge: Overcome limitations of manually managed skills/expertise databases (e.g. Dataware - experts self nominate)
  - incomplete
  - expensive
  - out of date
Related Work

0 Autonomy
   - document based (docs, Notes discussions, email)
   - dynamic expert profiling
   - Problem: reading/writing not always correlated w/expertise

0 Abuzz
   - Beehive email routes questions to experts based on expert profile (must seed this)
   - Expertise validated by community (+/- satisfaction with answers) updates profiles
   - Problem: Seeding/Learning curve

0 MIT’s ExpertFinder (Vivacqua)
   - expertise models from software library use

0 Tacit - email based keyword profiling
Our Focus

0 Implicitly determine expertise from
- multiple sources of evidence including intellectual products (e.g., briefings, papers, web pages)
- information seeking actions (e.g., web logs)

0 Leverage
- intranet publishing (staff, corporate newsletters)
- corporate directory services
- project leadership information

0 Exploit recent advances in information extraction
(language processing) technology
**Goal:** Place a user within one phone call of an expert

**Expert Finder**

- **User Issues Simple Query**
- **Employees Ranked by Mentions**
- **Integrated Employee Database**
- **Mentions of Employee in Corporate Communications**
- **Relevant Employee Publications**
- **Enterprise Employee Project Database**

**Examples:***

**MITRE Employees**

<table>
<thead>
<tr>
<th>Photo</th>
<th>Name</th>
<th>Dept</th>
</tr>
</thead>
<tbody>
<tr>
<td>3760</td>
<td>Benoit, John W D</td>
<td>W159</td>
</tr>
<tr>
<td>1100</td>
<td>Maybury, Mark T</td>
<td>G040</td>
</tr>
<tr>
<td>300</td>
<td>Morell, Ginger L</td>
<td>R103</td>
</tr>
<tr>
<td>200</td>
<td>Thorley, Lawrence H</td>
<td>G053</td>
</tr>
<tr>
<td>200</td>
<td>Potts, Frederick C</td>
<td>G04D</td>
</tr>
<tr>
<td>110</td>
<td>Duff, David A</td>
<td>W159</td>
</tr>
</tbody>
</table>

**John W Benoit**

- **Name:** Benoit, John W D
- **Phone:** 6511
- **Mail:** W640
- **Room Number:** S4322
- **Department:** W159
- **Employee ID:** 07092
- **Email:** benoit

**Mentioned in:**

- FY97 MITRE Corporate Strategic Technology Thrusts
- Project for John Benoit is Dictionary Mining for *machine translation*
ExpertFinder Algorithm

- Initial Form
  - Gather All URLs
    - Find Mentioned People
      - Find Published People
        - Combine Info
          - Weigh Evidence
            - Add Phone Book Info
              - Display Results
    - Call Search Engines
      - Parse Results
  - Yes: Cached Results?
  - No: Call Search Engines
Evaluation

0 Compare performance of ExpertFinder with (20) expert human resource managers
0 Task: Find top 5 corporate experts in a given domain
0 Measures
   - Agreement among humans
   - Agreement of machine with human(s)
      = Precision
      = Recall
0 Chance: # experts/4500 employees = often less than .1%
The Questionnaire

I am performing an experiment. Your participation will remain anonymous if you so desire and should only take a few short minutes. Please answer the following questions (preferably without any assistance, but if you use assistance indicate what kind you used):

1. Who are the top 5 "data mining" experts at MITRE (List them in rank order, most expert first. List as many as you can but no more than 5)?
2. the top 5 "collaboration" experts?
3. the top 5 "chemical" experts?
4. the top 5 "human computer interaction" experts?
5. the top 5 "network security" experts?
6. What is your top area of expertise (in a few words) and who do you consider to be the top 5 people in the company in your area of expertise?
Human vs ExpertFinder

- Comparison to 20 human resource managers
- Agreement = in top 5 IDed experts
- Precision = # correctly IDed experts / # IDed
- Recall = # correctly IDed experts/ # actual experts

<table>
<thead>
<tr>
<th>Expert Area</th>
<th>Human Agreement</th>
<th>ExpFinder Precision</th>
<th>ExpFinder Recall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data mining</td>
<td>70%, 49%, 24.5%</td>
<td>60%</td>
<td>40%</td>
</tr>
<tr>
<td>Chemical</td>
<td>40%, 8%, 0.8%</td>
<td>60%</td>
<td>40%</td>
</tr>
<tr>
<td>HCI</td>
<td>90%, 36%, 11%</td>
<td>60%</td>
<td>40%</td>
</tr>
<tr>
<td>Network Security</td>
<td>50%, 10%, 0.4%</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>Collaboration</td>
<td>70%, 35%, 17.5%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>AVERAGE</td>
<td>63%, 28%, 11%</td>
<td>41%</td>
<td>29%</td>
</tr>
</tbody>
</table>
Community of Interest Modeling

Organizational Theory

Pattern Analysis
- Work/Activity Sampling
- Feature Extraction
- Topic Detection
- Social Network Generation
- Community of Practice
  “Registration”…

Project Information
  Web Pages
  Meetings/Conferences/...
  Share Folders
  Published documents...

Clustering techniques
  Social network analysis methods
  Summarization

Emergence…
  Monitoring
  Communication
  Sharing
  Expert Finding
  Other Applications
Dynamic Community Tracking
Shared Users on Listserves
Holland’s G60 Social Network
(Nearest Neighbor Map)--- XperNET
Expert Communities: XperNet Network

Network Membership Ratings

Member Rank

Membership Score

Core Group

Expanded Group

Automatic Network Expansion
Social Network Analysis

Arcs connect individuals based on co-work. Color indicates organization.

Isolates

Structural Holes
Comparing Personal Nets

Recent Hire

Been Here a While...

Social Diversity

MITRE
Expertise Management Architecture

Service Broker

Services
- Finder
- Selection
- Qualification
- Registration
- Q&A

Resources
- E-dB
- MII
- WWW

Finder Agencies
Consulting Groups
Knowledge on Demand

- Knowledge Management Strategy
- Knowledge Extraction and Discovery
  - IntelGazette, BNN, AQUAINT, TIDES, GeoNODE
- Expert and Expert Community Discovery
  - ExpertFinder, XperNET
- Facilitating Group Knowledge Creation
  - KEAN, OWL
- Facilitating Knowledge Communication/Exchange
  - CVW, TrIM
- Conclusion
Words of “Wisdom”

0 **Bentov’s Law**: One’s level of ignorance increases exponentially with accumulated knowledge. When one acquires a bit of new information, there are many new questions that are generated by it, and each new piece of information breeds five-ten new questions. These questions pile up at a much faster rate than does accumulated knowledge. Therefore, the more one knows, the greater his level of ignorance.

0 **Allen’s Tenet** - The strength’s of one’s opinion on any matter or controversy is inversely proportional to the amount of knowledge that person has on that subject.

0 **BB’s Dictum** - In a group, the unknowing will try to teach the lesser-skilled or knowing
Knowledge Exchange and Annotation eNgine (KEAN): Search

SEARCH by
- Subject
- Keyword
- Employee
- Rating Level
- Time
KEAN: Source Assessment
Questions answered (with justification) by KEAN (e.g., data mining)

0 What information does Chris (expert in data mining) think is useful for data mining?
0 What information do people in the data mining community of practice find useful on data mining?
0 What information does everyone think is useful on data mining in the past few weeks?
0 What information on data mining have I found to be useful in the past?
KEAN Evaluation

- 26 individuals on 295 URLs
  - length of time on page ("reading" time)
  - explicit utility rating
- Focused task - directory services questions
  - Which standards organization defines the X.500 specification?"
  - "How does LDAP differ from X.500?"
  - "Name some of the data types that can be stored in an LDAP attribute."
- After the experiment, rate utility 1-10 (10 highest)
- Regression test yielded positive correlation
  - explicit utility = .0113*time read
  - 66% of all URLs "read" for greater than 78 seconds were classified as high utility (6-10)

Time --> utility
Organizational Wide Learning (OWL): Word Command Usage by Type

Command Usage by Type

- Edit: 50%
- File: 30%
- Format: 10%
- View: 5%
- Window: 5%
- Insert: 5%
- Tools: 5%
- Table: 5%
- Help: 5%
## OWL Data: Word’s Top 10 Commands

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Command</th>
<th>Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Edit Delete</td>
<td>34.2%</td>
<td>34.2%</td>
</tr>
<tr>
<td>2</td>
<td>File Save</td>
<td>10.5%</td>
<td>44.8%</td>
</tr>
<tr>
<td>3</td>
<td>File Open</td>
<td>8.7%</td>
<td>53.5%</td>
</tr>
<tr>
<td>4</td>
<td>Edit Paste</td>
<td>7.9%</td>
<td>61.4%</td>
</tr>
<tr>
<td>5</td>
<td>File DocClose</td>
<td>5.1%</td>
<td>66.5%</td>
</tr>
<tr>
<td>6</td>
<td>Edit Copy</td>
<td>4.2%</td>
<td>70.7%</td>
</tr>
<tr>
<td>7</td>
<td>Format Bold</td>
<td>3.7%</td>
<td>74.4%</td>
</tr>
<tr>
<td>8</td>
<td>File Print</td>
<td>2.8%</td>
<td>77.2%</td>
</tr>
<tr>
<td>9</td>
<td>Edit Cut</td>
<td>2.4%</td>
<td>79.7%</td>
</tr>
<tr>
<td>10</td>
<td>File SaveAs</td>
<td>1.7%</td>
<td>81.3%</td>
</tr>
</tbody>
</table>
Organizational Knowledge & Ignorance
Some individuals never use a number of the more frequently-used commands
OWL recommends what to learn next (unique to each individual at each point in time)

<table>
<thead>
<tr>
<th>USER #314</th>
<th>Expected</th>
<th>Observed</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edit Paste</td>
<td>170</td>
<td>274</td>
<td>OK</td>
</tr>
<tr>
<td>Edit Delete</td>
<td>129</td>
<td>0</td>
<td>New</td>
</tr>
<tr>
<td>Edit Copy</td>
<td>107</td>
<td>97</td>
<td>OK</td>
</tr>
<tr>
<td>Edit Cut</td>
<td>48</td>
<td>100</td>
<td>OK</td>
</tr>
<tr>
<td>Edit Undo</td>
<td>16</td>
<td>14</td>
<td>OK</td>
</tr>
<tr>
<td>Edit Find</td>
<td>12</td>
<td>1</td>
<td>More</td>
</tr>
<tr>
<td>Edit SelectAll</td>
<td>9</td>
<td>12</td>
<td>OK</td>
</tr>
<tr>
<td>Edit DeleteWord</td>
<td>4</td>
<td>0</td>
<td>New</td>
</tr>
<tr>
<td>Edit Replace</td>
<td>3</td>
<td>0</td>
<td>New</td>
</tr>
<tr>
<td>Edit PasteSpecial</td>
<td>2</td>
<td>0</td>
<td>New</td>
</tr>
</tbody>
</table>
Do OWL Users Use Help?

- More than half (12/20) use help at least monthly.

- Only a few (6/20) use Office Assistant
Instrumentation + Planning: WOSIT and COLAGEN

End User Application: TARGETS

Instrumentation: JOSIT

Tutoring Agent: Collagen (MERL)

Instrumentation Software

JOSIT: http://www.mitre.org/tech_transfer/josit/
WOSIT: http://www.mitre.org/technology/wosit/

POC: Drs. Abigail Gertner, Brant Cheikes, Brad Goodman, Frank Linton
Embedded Tutoring System

First, I will select the lateral path tool. Before defining waypoints, it is necessary to put the map tool in drawing mode by selecting the lateral path tool.
How well do people make judgments?

0 Judgment biases - deviations from normative judgments
0 Some known strong biases

Law of small numbers: jump to conclusions with too little data

Interpreting randomness: assigning causality to random events

Illusory correlations: seeing correlations where none exist

Confirmation bias: ignore or underweight information that is inconsistent with current judgment

Overconfidence: overestimate accuracy of judgments

Fundamental attribution error: attributing causality to person, not situation

Illusion of Control: people believe they have more control over chance outcomes than they actually do

Hindsight bias: people believe they predicted an events they didn’t…. many others

Judgment biases and illusions are ubiquitous
Structured Argument

- A formal representation that makes explicit both the elements of an argument and the relationships among those elements.

- Elements of an argument include:
  - Hypothesis, claim, or question
  - Evidence
  - Data
  - Chains of reasoning

- Relationships include:
  - Relevance
  - Credibility
  - Inferential force
Argument-Based Exercise
Knowledge on Demand

0 Knowledge Management Strategy
0 Knowledge Extraction and Discovery
   - IntelGazette, BNN, AQUAINT, TIDES, GeoNODE
0 Expert and Expert Community Discovery
   - ExpertFinder, XperNET
0 Facilitating Group Knowledge Creation
   - KEAN, OWL
0 Facilitating Knowledge Communication/Exchange
   - CVW, TrIM
0 Conclusion
The Tyranny of Distance

Proximity and Communication

Probability of communicating at least once a week

Proximity and Collaboration

<table>
<thead>
<tr>
<th>Office Location</th>
<th>Probability of research collaboration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same corridor</td>
<td>10.3%</td>
</tr>
<tr>
<td>Same floor</td>
<td>1.9%</td>
</tr>
<tr>
<td>Different floor</td>
<td>0.3%</td>
</tr>
<tr>
<td>Different buildings</td>
<td>0.4%</td>
</tr>
</tbody>
</table>

Source: Jessica Lipnack and Jeffrey Stamps, PhD

Based on proximity, people are not likely to collaborate very often if they are more than 50 feet apart.

Tom Allen, MIT, 1977

Bell Communications Research & Univ. of Arizona, 1988
Levels of Collaboration

Shared Intent

Joint Work

Coordination

Shared Information

Awareness

Unsuccessfully individual attempts

Levels modified from Hall, T. US Intelligence Community Collaboration Study, 1999
## Collaboration Levels, Activities, Tools

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>Activities</th>
<th>Tools</th>
<th>Media</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shared Intent</strong></td>
<td>• Shared Purpose</td>
<td>• Strategic Alliances</td>
<td>• Face-to-face</td>
</tr>
<tr>
<td></td>
<td>• Co-dependent</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Joint Work</strong></td>
<td>• Shared goals</td>
<td>• Workflow</td>
<td>• Application actions</td>
</tr>
<tr>
<td></td>
<td>• Joint goal creation</td>
<td>• Whiteboard</td>
<td>• Gesture</td>
</tr>
<tr>
<td></td>
<td>• Cross-organizational teams</td>
<td>• Shared applications</td>
<td>• Text</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Audio</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Video</td>
</tr>
<tr>
<td><strong>Co-ordination</strong></td>
<td>• Shared plans</td>
<td>• Decision Support</td>
<td>• Text</td>
</tr>
<tr>
<td></td>
<td>• Group meetings</td>
<td>• Brainstorming tools</td>
<td>• Audio</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Video</td>
</tr>
<tr>
<td><strong>Shared Information</strong></td>
<td>• Meetings</td>
<td>• E-mail, chat, VTC</td>
<td>• Text</td>
</tr>
<tr>
<td></td>
<td>• Conferences</td>
<td>• Web pages, Portals</td>
<td>• Messages</td>
</tr>
<tr>
<td></td>
<td>• Briefings and presentations</td>
<td>• Publications</td>
<td>• Audio</td>
</tr>
<tr>
<td></td>
<td>• Training</td>
<td></td>
<td>• Video</td>
</tr>
<tr>
<td><strong>Awareness</strong></td>
<td>• Shared calendars</td>
<td>• Electronic calendars</td>
<td>• Text</td>
</tr>
<tr>
<td></td>
<td>• Shared presence</td>
<td>• Publish/subscribe</td>
<td>• Graphics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Alerts</td>
<td>• Audio</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Presence</td>
<td>• Video</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Expert finding</td>
<td></td>
</tr>
</tbody>
</table>
Collaborative Virtual Workplace (cvw.sourceforge.net)
Welcome to the Collaboration web site. Created in the public interest, the purpose of this site is to share unclassified information on collaboration needs, technologies and uses across academia, government and industry. We look forward to your feedback and recommendations to make this site more valuable.

This site has been modified to allow room for growing content. Clicking on Site Map at the top, will invoke a page that shows all content on this site. The Calendar link will take you to past and present Summits, Conferences and Workshops.

10/01 Five books free to download in the area of Collaboration. Working in a distributed company "face time," and the already significant trend to multi-site and distributed organization will dramatically increase. We've spent the last 20 years figuring out how to make it easier to work at a distance. written by Jessica Lipn and Jeffrey Stamps, http://www.virtualteams.com/

09/01 Addition to the Tools sections
08/01 Addition to the Standards section
02/01 ACEE CIWG Updated Briefings 3/20
(Military Communications-Engineering Board Collaboration Interoperability Working Group)
12/00 Collaborative Operations in Joint Expeditionary Force Experiment (JEFX) 99
11/00 - Practitioner's Guide to Evaluating Collaboration Systems by Tamra Hall
10/00 - Collaboration Security Summit updated content 3/11
9/00 - Press Release for collaboration.mitre.org
Translingual Instant Messaging (TrIM)

Jean-Yves has joined the conversation

<Keith says> Hello
(Bonjour)

<Jean-Yves says> Hello
(Salut)

<Keith says> Where do you live in France?
(Où est-ce que vous habitez en France?)

<Jean-Yves says> Currently, I live in Paris but I was born to Aix.
(Actuellement, j’habite à Paris mais je suis né à Aix.)

<Keith says> What is *Aix*?
(Quel est *Aix *?)

<Jean-Yves says> Aix is an academic city in the noon. Very pretty...
(Aix est une ville universitaire dans le midi. Très jolie ... )

<Keith says> In the noon? What do you mean?
(Dans le midi? Qu’est-ce que vous signifiez?)

<Jean-Yves says> in the south.

Oh, yeah, I’ve heard of it. I'm from a university town, too.
Sample Multilingual Chat: Monolingual View

<#keith_miller_ll says> Welcome to Mitre (French)
*** owner sets room mode: free entry, free speech ***
<Keith says> Bonjour
<Jean-Yves says> Salut
<Keith says> Où est-ce que vous habitez en France?
<Jean-Yves says> Actuellement, j’habite à Paris mais je suis né à Aix.
<Keith says> Quel est *Aix* *?
<Jean-Yves says> Aix est une ville universitaire dans le midi. Très jolie ...
<Keith says> Dans le midi? Que vous signifiez?

Diyden has left the conversation
Knowledge on Demand

0 Knowledge Management Strategy
0 Knowledge Extraction and Discovery
   - IntelGazette, BNN, AQUAINT, TIDES, GeoNODE
0 Expert and Expert Community Discovery
   - ExpertFinder, XperNET
0 Facilitating Group Knowledge Creation
   - KEAN, OWL
0 Facilitating Knowledge Communication/Exchange
   - CVW, TrIM
0 Conclusion
• Strategy
  Peter Senge
  “Learning Organizations”

• Process
  Takeuchi and Nonaka
  “Organizational Knowledge Creation”

• Benchmarking
  Norton and Kaplan
  “Balanced Scorecard”
Lessons Learned

- **People**, and the **cultures** that influence their behaviors, are the single most critical resource for successful knowledge creation, dissemination, and application. *Understand and influence them.*

- **Cognitive**, **social**, and **organizational learning processes** are essential to the success of a knowledge management strategy. *Focus your strategy on enhancing these processes.*

- **Measurement**, **benchmarking**, and **incentives** are essential to accelerate the learning process and to drive cultural change. *Create a tailored balanced scorecard to target what you want to improve.*

- Knowledge management programs can yield impressive benefits to individuals and organizations if they are **purposeful**, **concrete**, and **action-oriented**. *Make yours so.*
In times of profound change, learners inherit the Earth, while the learned find themselves beautifully equipped to deal with a world that no longer exists.

- Al Rogers -
Many Grand Challenges

- User, Group and Organization Modeling, including knowledge, beliefs, goals and plans
- (U, G, O) Tailored presentation of knowledge
- Ontological integration of distributed DB & KB
- Universal knowledge access independent of user physical, perceptual, cognitive, cultural characteristics
- Organizational strategies for knowledge sharing
- Knowledge strategies in global, multicultural enterprises
- Privacy and Security
Acknowledgements

0 Knowledge Management - Cynthia Small, Jean Tatlias
0 TIDES - Lynette Hirschman, Jay Ponte et al.
0 GeoNODE - Rod Holland, John Griffith et al.
0 QANDA - Marc Light
0 OWL - Frank Linton
0 CVW - Jay Carlson, Deb Ercolini et al.
0 TrIM - Rod Holland, John Ramsdell, Flo Reeder, Jay Carlson, Justin Richer, Galen Williamson, Michael Krutsch, Keith Crouch, Keith Miller
0 IntelGazette - Jerry Cogle, Ray D’Amore et al.
0 XperNET - Ray D’Amore, Manu Konchady
0 KEAN - Daryl Morey, Tim Frangioso
0 ExpertFinder - Dave Mattox, Inderjeet Mani, David House
KNOWLEDGE ON DEMAND:
Knowledge and
Expert Discovery

Dr. Mark T. Maybury
Executive Director
Information Technology Division

Knowledge Management Conference
Baden Baden, Germany
15 March 2001

http://www.mitre.org/resources/centers/it