Understanding the Application of Knowledge Management in a Technology Driven Industry

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Why Knowledge Management ?

- The benefits of Knowledge Management are traditionally focused on:
  - Reducing cost and risk
  - Leveraging existing assets to reduce cost, risk & cycle time
  - Improved Decision Making
  - Improved Strategic Planning,
  - Faster Development of New Technical Approaches
  - Faster more Robust Problem Solving
  - Reduced Cost of Employee Training
  - Increased Versatility of the Workforce

These can benefit almost any business, but there are additional benefits in a technology driven industry like Aerospace or Computing.

Why Knowledge Management for the AIAA?

- The AIAA has over 30,000 members.
- The AIAA publishes 8 peer-reviewed technical journals
- The AIAA hosts over 20 technical conferences a year.
- The technical work of the AIAA is performed through 69 Technical Committees (TC) arranged in seven disciplines:
  - Aerospace Sciences
  - Aircraft and Air Transportation Systems
  - Engineering & Technology Management
  - Information Systems
  - Propulsion and Energy
  - Space and Missiles
  - Structures, Design and Test

There are many potential benefits to be derived from efficient knowledge sharing among these diverse elements of AIAA.

Information and Knowledge

- Information is not knowledge
- Information is usually simply "data" in some sort of formation (numbers, text, images, sound, …)
- Knowledge is:

  "… a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information"
- And Wisdom is more than just Knowledge

(Davenport and Prusak)

Exploiting the Difference Between "Data" and "Knowledge"

A specific example from experimental aeronautics

- Quality and productivity in experimental aeronautics have traditionally focused on ***data*** as the primary product of an empirical study.
  - **A productive test** maximizes the volume of ***data***
  - **A high-quality result** generates ***data*** with a minimum of unexplained variance
- NASA Langley Research Center has introduced a testing process called the **Modern Design of Experiments (MDOE)** that focuses on ***knowledge*** as the product of experimentation rather than ***data***.
  - Tactical objectives change from data collection to enhancing knowledge of the system under study
  - This radically changes how we assess productivity and quality.

The Modern Design of Experiments

A Knowledge Management Approach to Scientific Experimentation

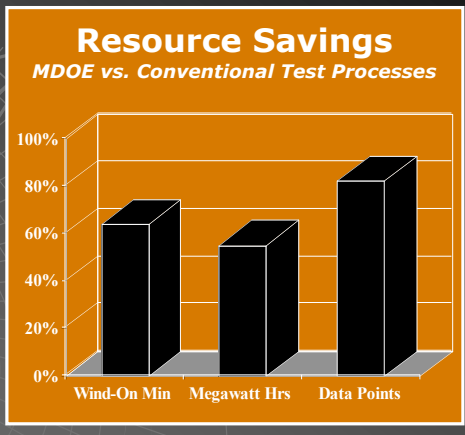
- **Knowledge** of a system is said to be attained in an MDOE test when all system responses of interest can be adequately predicted
  - "Adequately" implies acceptable precision over the full range of independent variables of interest (not limited only to variable combinations measured.)
  - **Example:** When the drag coefficient of a commercial jet transport can be estimated within ±0.00005 with 95% confidence for any Mach number between 0.70 and 0.96, and any angle of attack between -4° and +10°.
- **A productive *MDOE* test** *minimizes* the data volume required to adequately predict system responses.
  - This minimizes cycle time and direct operating costs
  - Opposite of traditional productivity metrics that promote high data volume.
- **A high-quality *MDOE* result** features high precision in the system response predictions
  - ***Data quality* is only a cost issue:** high variability simply requires more data
  - Quality results can be achieved no matter how much variability in the data

Savings of a factor of two in cost and cycle time are not uncommon with this change in focus from high-volume data collection to low-cost knowledge enhancement.

Representative MDOE Resource Savings

Focusing on Knowledge rather than Data

- Independent comparisons of MDOE and conventional test processes were conducted over a 12-month period
- Wind tunnel tests were conducted in multiple facilities
- Subsonic, transonic, supersonic flight regimes
- Resource comparisons were made for wind-on minutes, megawatt hours, and total data volume.

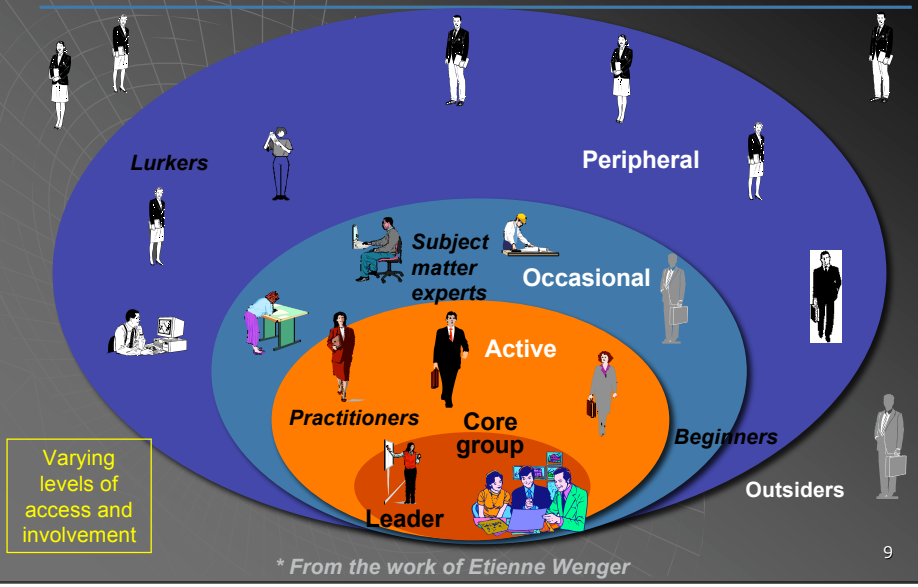


Communities of Practice (CoP)

A structure for managing knowledge

- "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." (Wenger)
- "CoP's are not just a web site, a database, or a collection of best practices. It is a group of people who interact, learn together, build relationships, and in the process develop a sense of belonging, and mutual commitment." (Wenger)
- *"Without Communities of Practice, there can be no knowledge management."* (Wenger)
- In the last 10 years electronic CoP's have been developed that are very effective (e.g. **companycommand.army.mil** with 20,000 members) ("CompanyCommand: Unleashing the Power of the Army Profession" by Nancy M. Dixon, Nate Allen, Tony Burgess, Pete Kilner, Steve Schweitzer)

CoP Model: Participation & Roles



** From the work of Etienne Wenger*

Rockwell Collins

An example of Communities of Practice in action

- Rockwell Collins is a global company providing aviation electronics for the world's aircraft manufacturers and more than 400 airline customers, as well as a major share of the world's military forces.
  - Global company- 17,000 employees in 27 countries
- Communities of Practice began Jan 2002
  - Today:
    - 8 Major Knowledge Boards
      - Electrical, Enterprise, Factory Transition, Financial Practices, Mechanical, Project Mgmt, Software, and Systems
    - 80 CoPs *(and growing!)*
- The RCI KM structure is centered around the PEOPLE and their "Problems" – their work
- Practitioners Role:
  - "Practitioner driven and Practitioner Led"
  - Launch, Lead, and Learn

Return on Intellectual Capital

You don't have to teach everyone everything. The goal isn't to stuff the same knowledge into as many heads as possible, but to improve your return on intellectual capital. You can reduce the efforts of many by leveraging the knowledge of a few.

- Thomas A. Stewart

Most Admired Knowledge Enterprise (MAKE Award)

Most Admired Knowledge Enterprise Studies

- Global, North American, European, Asia and Japan MAKE awards annually
- Part of Teleos' MAKE Research Program
- Based on the Delphi Methodology
  - Developed in the 1950's by the Rand Corporation as a long range forecasting tool
  - Expert panel's perceptual knowledge to identify critical issues
  - Identify those organizations which are leaders in creating organizational **intellectual capital and wealth** thought the transformation of individual enterprise knowledge into world class products/services /solutions
- Further details
  - http://www.knowledgebusiness.com

Toyota Motor Corporation

- MAKE winner Global (3 times), Asia (3 times) and Japan (5 times)
- Toyota is the second largest automobile manufacturer by volume
- Annual sales of $153 billion and employs over 260,000 people
- Toyota Production System is well known (The Machine that Changed the World – Womak et al.)
  - JIT (Just-in-Time)
  - Kaizen (Continuous Incremental Improvement)
  - Pull system (Tasks based on downstream pull)
- Toyota Product Development System is less well known
  - Focus on business performance
    - Apply technologies that sell cars
  - Value customer's opinion
    - Multiple choice systems design (performance/cost tradeoffs)
  - Standardized development milestones
    - Similar program structure across all vehicle programs
    - Schedule customized by chief engineer
    - No standard development process
  - Prioritize and reuse
    - 60-70% of vehicle parts are common
    - Toyota Production System Principles

Toyota Motor Corporation

- Functional teams
  - Highly skilled core knowledge
  - Value learning/knowledge gathering
  - Mentor/apprenticeship system is managers responsibility/job function
  - Maintain lessons learned books
- Set Based Concurrent Engineering
  - Parallel evaluation of multiple alternatives
  - Impose minimal constraints on design requirements
  - Efficient Documentation using 8.5" x 11" pages with standard format
  - Focused discussion meetings
- Supplier Involvement in the Process
  - Long term relationships
  - Toyota keeps current on suppliers design and manufacturing capabilities
    - New technology and innovation
    - Works with suppliers to improve suppliers' capabilities if required
- Chief Engineer System
  - Reports back after launch with results and lessons learned
  - Designs and orchestrates all aspects of the vehicle development
  - Highly skilled in one or more functional areas with 20+ years of experience
  - Respected for expertise

Car Development in 18 mo is half US competitors with 150 vs 600 people
US competitors productivity is estimated to be 20% vs Toyota at 80%

AIAA Knowledge Management- Strategic Plan

The AIAA Knowledge Management strategic plan lists eight goals:

1. Focus AIAA Activities on Critical and Emerging Technologies, Capabilities, and Programs
2. Strengthen Internal and External Communications
3. Improve and Expand Services and Benefits to AIAA Members
4. Increase the Depth and Breadth of AIAA Membership
5. Establish AIAA as the Voice and Advocate of/ for the Profession
6. Stimulate Workforce Development and Retention
7. Fully Utilize Information Technology
8. Communicate and Involve our Stakeholders in the Implementation of the Strategic Plan

AIAA KM Committee Recommendations

1. Establish virtual (online) Communities of Practice (VCoP's) to allow the members to communicate easily and continuously. AIAA would enable every TC, every journal, and every conference organizing committee to create and manage (on their own) online community. These online communities will increase the value of being an AIAA member, increase the interest in the AIAA digital library, and make it easier for the TCs and journals to function.

Research shows that 1 in 3 CoPs may fail- even VCoPs will require KM Staff to nurture and support

AIAA KM Committee Recommendations

2. Create several (3 – 5) key online communities as initial deployments or pilots, with teams of people willing and able to help make it a success. Starting with VCoPs that we believe to have a high success rate will continue to improve the model and the process as VCoPs are extended to other areas of the AIAA. Incremental development, careful deployment, and selection of areas for rich opportunity would allow for a 3-5 AIAA communities to launch in 2006, with another 3-5 communities launching in 2007.

AIAA KM Committee Recommendations

3. We recommend launching the pilot VCoPs for the following AIAA communities:
   - The Journal of Aerospace Computing, Information, and Communication (JACIC) community
   - Software Systems and Computer Systems Technical Committees
   - 2007 InfoTech Conference

Conclusion

Success criteria for the proposed start-up AIAA VCoPs should be assessed using metrics such as papers submitted, web hits, assessments, and user surveys. The AIAA KM Committee would support the members, assist with the tool selection, and monitor the metrics.

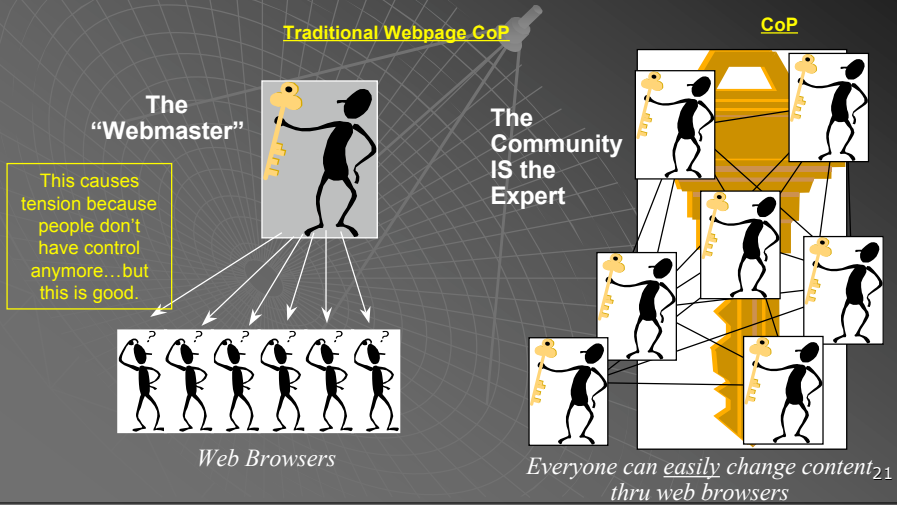
A Change Management Plan and a strong support structure needs to be incorporated with this KM plan. Make no mistake- it is not easy to change culture.

The tacit knowledge resides in people, and there must be a priority to begin transferring and sharing that knowledge now. Knowledge reuse is an important part of retaining the US competitive position in aerospace.

Backup Data

CoP Software

- The most difficult thing for most people to understand is that most CoP sites let ALL MEMBERS modify the website content (and very easily).



Archival Journals

- The foundation of science and engineering
- Paper versions are expensive to produce, distribute, and store
- Information that is not on-line will be used and referenced less and less ("if it isn't online, it doesn't exist")
- The American Institute of Aeronautics and Astronautics (AIAA) has its *entire archive* of conference and journal papers scanned and available on-line (40 years of technical papers) (www.aiaa.org)
- NASA has begun to convert both NACA and NASA papers to electronic form
  - http://techreports.larc.nasa.gov/ltrs/ltrs.html
  - http://ntrs.nasa.gov
  - http://naca.larc.nasa.gov

Archival Journals

The merging of Journals and CoPs will create a system for creating new knowledge while balancing that knowledge with a validation scheme. The CoP and the journal should meet through a multi-tiered validation system that transports CoP style informal conversational knowledge into fully validated explicit knowledge

www.aiaa-cstc.org

CoP for AIAA CS TC, Webspace purchased from: http://www.acmeinternet.com for $600/year

Home | Documents | Discussion Boards | Lists | Create | Site Settings | Help

AIAA Computer Systems Technical Committee
Home

Quick Launch
- General Discussion
- Contacts
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- Meetings 2000+
- Charter & Purpose
- COTS Guidebook
- COTS Guidebook Discussions
- Meetings 1990's
- Events
- 2004 Reno Technical Session Discussions
- Combined Brochure
- Combined Brochure Updates Discussion
- AIAA Website Changes Discussion
- Strawman Topics Discussion
- Software Engineer Registration Discussion
- Industry Consolidation
- Strawman topics
- JACIC

Search Documents

Announcements Add new announcement

There are currently no active announcements. To add a new announcement, click "Add new announcement" above.

Events Add new event

10/20/2003 12:00 AM 18th Annual OOPSLA
Object Oriented Programming, Systems, Languages and Applications

10/30/2003 12:00 AM Intl. Conf. on Compilers, Architectures and Synthesis for Embedded Systems
Demand for high performance embedded computing and increases in complexity of embedded software require leveraging diverse architecture, microarchitecture and compiler research. Application-specific solutions are needed in embedded areas, such as digital...

11/10/2003 12:00 AM 15th Syposium on Computer Architecture and High Performance Computing
SBAC-PAD is an international annual conference, started in 1987, which has continuously presented an overview of new developments, applications, and trends in parallel and distributed computing technologies. SBAC-PAD is open for faculty members, researchers,...

11/19/2003 3:00 PM Joint TC Telecon
Call in Number to be provided on 11/17.

1/5/2004 12:00 AM AIAA Aerospace Sciences Conference
The 42nd AIAA Aerospace Sciences Meeting and Exhibit with its traditionally multidisciplinary character provides an ideal forum for scientists and engineers from industry, government, and academia to share and disseminate the scientific knowledge and...

1/5/2004 9:00 AM Joint TC Meeting

Links Add new link
- AIAA Conferences
- JACIC (new Journal)
- DASC Website
- AIAA SSTC Web Site
- AIAA CSTC Web Site
- Main CSTC Web Site
- AIAA Technical Committees
- AIAA Home Page

companycommand.army.mil

(uses Tomoye Simplify)

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Co Team > CompanyCommand — guest (Read)

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Login/Password Problems?

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Building Combat-Ready Teams!

Main | Discussions | What's New

A Web site by and for Company Commanders--past, present, and future...[read more]

Photo: Dexter Holley (B/2-72 AR)

COs: Is CC.com making a difference for you?

During Oct/Nov, we are focusing on "Training." Go to that section of the site, take this month's Cmd Quiz, join ongoing discussions, and contribute your training ideas.

Visit our Sister Site PlatoonLeader

CMD Quiz
Q: Does "training" fit into an operational environment?
Take Quiz
View Results
19 Comments

Navigate
- CompanyCommand
- Leadership
- Warfighting
- Training
- Fitness
- Force Protection
- Maintenance
- Supply
- Soldiers & Family
- Pro Readings
- Rally Points
- Cdrs' Log

Collapse All
Site Map

Most Recent Discussions:
To post discussions you must be registered and logged on

Discussion Forum	Thread	Posts	Last Post @
CompanyCommand General Discussion	1SG Duty Description	2	2003-10-22 5:08 pm
Training: Open Discussion	CS/CSS Battlefield Survivability	7	2003-10-21 11:58 pm
CompanyCommand General Discussion	Convoy Operations Lessons Learned Needed	7	2003-10-21 11:35 pm
Warfighting Discussion	Civilian GPS in Iraq?	7	2003-10-21 6:47 pm
Training: Open Discussion	Training TTPs: What is working?	5	2003-10-21 4:37 pm
CompanyCommand General Discussion	Body Armor	6	2003-10-21 2:20 pm
Fitness Discussion	Profile PT Program	1	2003-10-20 3:09 pm
Video OPD: Open Discussion	Leadership in Operation Iraqi Freedom	2	2003-10-19 8:08 pm
Training Quiz: Open Discussion	Training in Operational Environment	1	2003-10-19 8:51 am
CompanyCommand General Discussion	Change of Command	7	2003-10-15 11:53 pm

Featured
in CompanyCommand
- Growing the Next Generation of Leaders
- To Kill or Not to Kill: a Cdr Sets the Example
- Training Priorities: What is Important to You?
- Cdrs' Log
- Training TTPs: What is working? (5)
- Company Commanders' Combat Observations/Lessons Learned
- Interviews with Company-Level Leaders in War

Featured Challenge:
Commander Stress
Take the Challenge

CMD Update
AUG/SEP 2003 C-LL Newsletter (Issue #26) ☆☆☆ The CDR/1SG Relationship (1 comment)

Special Book Program

platoonleader.army.mil

(uses mySQL and PHP, ie free software)

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19:03 Bragg | 18:03 Hood | 16:03 Lewis | 08:03 Korea | 04:33 Afghanistan | 03:03 Iraq | 01:03 Bosnia

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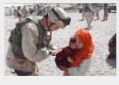
Recent Tools
- 026 Cheat Sheet
- APFT Roster Score...
- 11 ACR Miles Inve...
- Retrans Team Trai...
- 2-69AR Convoy Ops...

What's HOT!

Physical, Cultural, and Military Geography of Iraq—PDF

Survey
The most important Leader Competency is:

21 Oct 0630 EST



Check out some of the Q&A's from some company leaders currently serving in IRAQ: Video OPD, LT O'Hern; A Wise LT; CPT Morgan, Jake Jacobs, 2LT Blickhahn, LT Mitroka,LT Stuewe, LT Mason, CPT Polsgrove, CPT Woodward, CPT Zinn, Shock Troop and CPT Toti, CPT McGahey, 2LT Mead, CPT Wrann, LT Pickler, LTC Barbee, 1LT Marcee.

Monthly Newsletter: Register here!

Recent discussions in the PL Forums

Forum	Topic	Replies	Views	Last Post
Special Forces	General Boykin	11	377	10/22 18:27
Pre-Commissioning Questions	Grossly unprepared	7	444	10/22 18:04
Field Artillery LT's	Wait on FAOBC	1	57	10/22 16:39
Armor LT's	Armor OBC, November 17, What t...	10	341	10/22 15:38
Transportation LT's	Eustis Suggestions	18	414	10/22 14:13
Platoon Leader Questions	Hard headed squad leader	28	1374	10/22 13:44
Platoon Leader Questions	Conduct in Uniform	28	1671	10/22 12:24
Platoon Leader Questions	Any thoughts...	14	1025	10/22 11:44
Field Artillery LT's	Cell Phone service at Ft. Sill...	3	88	10/22 11:29
Aviation LT's	What to do?	8	342	10/22 10:44
MI LT's	MI vs other branches	2	234	10/22 01:20
Transportation LT's	deployments in the 6th batalli...	2	75	10/21 20:52
Quartermaster LT's	Duty Stations CONUS	1	67	10/21 19:13
Armor LT's	Not taught in AOBC	1	238	10/21 18:56
Reserve Component Issues	Paying for OBC	6	234	10/21 16:44

Read ALL forum postings since your last visit
Only works if you are Registered & Logged On

Daily Quote
"The essential thing is action. Action has three stages: The decision born of thought, the order or preparation for execution, and the execution itself. All three stages are governed by will. The will is rooted in character, and for the man of action character is of more critical importance than intellect. Intellect without will is worthless. Will without intellect is dangerous."
-- Von Seekt

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Who's Online
There are currently, 24 guest (s) and 6 member(s) that are online.

drill_lt, SEPPL, more...

You are Anonymous user. You can register for free by clicking here.

Last Seen
LtGoForBroke: 54 seconds ago
M_Raymond: 2 minutes ago
Drill_LT: 6 minutes ago

www.companycommand.com

- Largest and most successful CoP in the DOD
- Created to help army captains share information and knowledge
- ~80,000 hits/month & 20,000 regular members
- Enormous amounts of information available (not open to public anymore)
- Run by four Army Majors (all West Point professors)
- Often the Generals do not have all the knowledge that the soldiers need (e.g. soldiers returning from Iraq can transfer their knowledge to new soldiers)
- On-line video interviews of soldiers in Iraq and Afghanistan
- Began with PHP/mySQL but now uses Tomoye Simplify

References

- Rick Wallace, V.P. of SAIC, *CoP Short Course*, Army Knowledge Management Symposium, 2003
- Etienne Wenger, Richard McDermott, and William Snyder, *Cultivating Communities of Practice*, Harvard Business School Press, 2002
- Hubert St Onge and Debra Wallace , *Leveraging Communities Of Practice For Strategic Advantage, 2002*
- *Davenport, T. H. and Prusak, L., Working Knowledge: How Organizations Manage What They Know,* Harvard Business School Press, 2000
- *Long & Schweitzer, paper:* http://www.personal.psu.edu/lnl/papers/aiaa2004_1264.pdf
- *Schweitzer seminar:* http://www.ics.psu.edu/fallnotes/cop1.pdf

Acronyms

- KM = Knowledge Management
- CoP = Community of Practice
- CoI = Community of Interest (often made up of numerous communities of practice, ie community of communities, Knowledge Boards)
- EIP = Enterprise Information Portal
- CMS = Content Management System
- CIC = Computing, Information, and Communication
- JACIC = Journal of Aerospace Computing, Information, and Communication

Knowledge

- There are (at least) two types of knowledge:
  - Tacit and Explicit
- Tacit knowledge is part of people's assumptions and experiences- such as- *how to ride a bike- perform brain surgery-* the intuition you get after doing something for years- "the expert"
- Explicit knowledge is represented by papers, videos, procedures, etc.
- Perspective is important, one persons "explicit knowledge" is another persons "information"
- Conference papers and archival papers are an *attempt* to transfer tacit knowledge from one person to another

Human-human interactions are crucial to effective and efficient knowledge transfer- i.e. "story telling"

Why Knowledge Management ?

- KM is crucial for corporations, the defense department, Universities, and any other large organization
- KM is 95% culture-people-politics-process and 5% Technology
- How do we get people to join an on-line community and share information, which leads to increased productivity and innovation? What's In It For Me (WIIFM)?

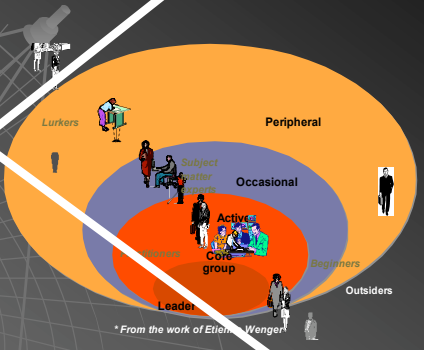
What's In It For Me (WIIFM)?

People want to:

- Be efficient
- Have access and leverage of others' knowledge Be integrated into the industry direction
- Be mentored and trained

"Because wealth creation is now in people's heads rather than in their hands, your success will depend not only on your ability in managing workflow but on your talent in enticing from each person his best ideas, judgments, and effort."

Frances Horibe

Access Control Lists

- ACL's are crucial to making it all work in a virtual environment
- In a CoP, the various levels of users require different levels of access (none, read, edit, delete)
- This refers to more than just file access, it also refers to the layout of the website, user accounts, access to various portions of website, ...
- Portions of VCoP might be open to world, and portions might require high security