



# **Providing Customer Support in the High Performance Computing Environment**

**CUG 2006, in Lugano, Ticino, Switzerland  
May 8–11, 2006**

**Barbara Jennings, Project Lead**

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company,  
for the United States Department of Energy's National Nuclear Security Administration  
under contract DE-AC04-94AL85000.





# The Topics for this Presentation

---

- **Project Management Design**
- **Knowledge as Corporate Capital**
- **Perceived Effectiveness**
- **How does this Relate to Customer Support**
- **The Design Process**
- **User Perspective**
- **Knowledge Framework**
- **Future**



# Project Management Design

---

- **Background - Usage Model**
  - LLNL, LANL, Experts as Consultants
- **Project Design - IEEE Standards 1058-1998**
  - Requirements, Planning, Prototype, Test
- **Grounded Theory Learning Model**
  - Carroll, Minimalist; Csikszentmihalyi, Flow
- **Information Management Design - Knowledge Community**
  - Knowledge situated in DC
  - Creation through socio-techno information exchange
  - Perry - Cognitive Theory, Hutchins Adaptive Interaction among subsystems



# Knowledge the Intangible Capital Asset

---

- **At Sandia: Knowledge Preservation Project**
  - Transfer knowing from one generation to the next
- **Academic Perspective**
  - Knowledge comes from acquiring information—Knowing comes from ownership
  - From Knowledge to Knowing the Spiral of Knowledge: Tacit->Explicit->Tacit, Nonaka & Takeuchi

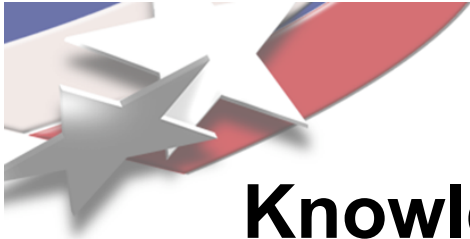


# What Is a Knowledge-Centered Culture

---

**An environment of trust where everyone's contribution is valued and consisting of:**

- **Learning**
  - Learning increases performance
- **Mentoring**
  - Providing a path for the new comers
- **Collaboration**
  - Collective brain power enables users to maximizing the resource potential
- **Sharing Ideas**
  - Value of knowledge increases with its accessibility and the frequency that is shared



# Knowledge is information in many forms

---

- **Knowledge can be seen in terms of specialists**
- **Collaborating or orchestrating the efforts of multiple individuals**
- **Knowledge exists in distributed resources not just the mind of one individual or individuals**
- **Sharing the knowledge requires one individual passing their tacit understanding (skills and knowledge) to explicit knowledge (e.g. a repository) that is then available later for another's tacit use**



# Information-based Organizations Have a Capital Asset in Knowledge

---

- **Lessons learned are essential to cultural competitiveness**
  - **Providing a base of knowledge from which to leverage to Internal challenges**
- **Assist to deliver sustainable and distinctive competencies in the future**
  - **Knowledge Management today provides needed information in the future**
- **Competitiveness hinges on management of intellectual resources**
  - **Provides sound basis for competition with external companies**
- **Benefit to the: individual, group, and organization**

**“The first thing is to find out what everyone else knows and begin where they leave off.”**

**--Thomas Alva Edison, 1827 1931**



# **Empirical studies suggests perceived effectiveness from knowledge sharing at three levels ...**

---

- **Individual**
- **Group**
- **Organizational Level**





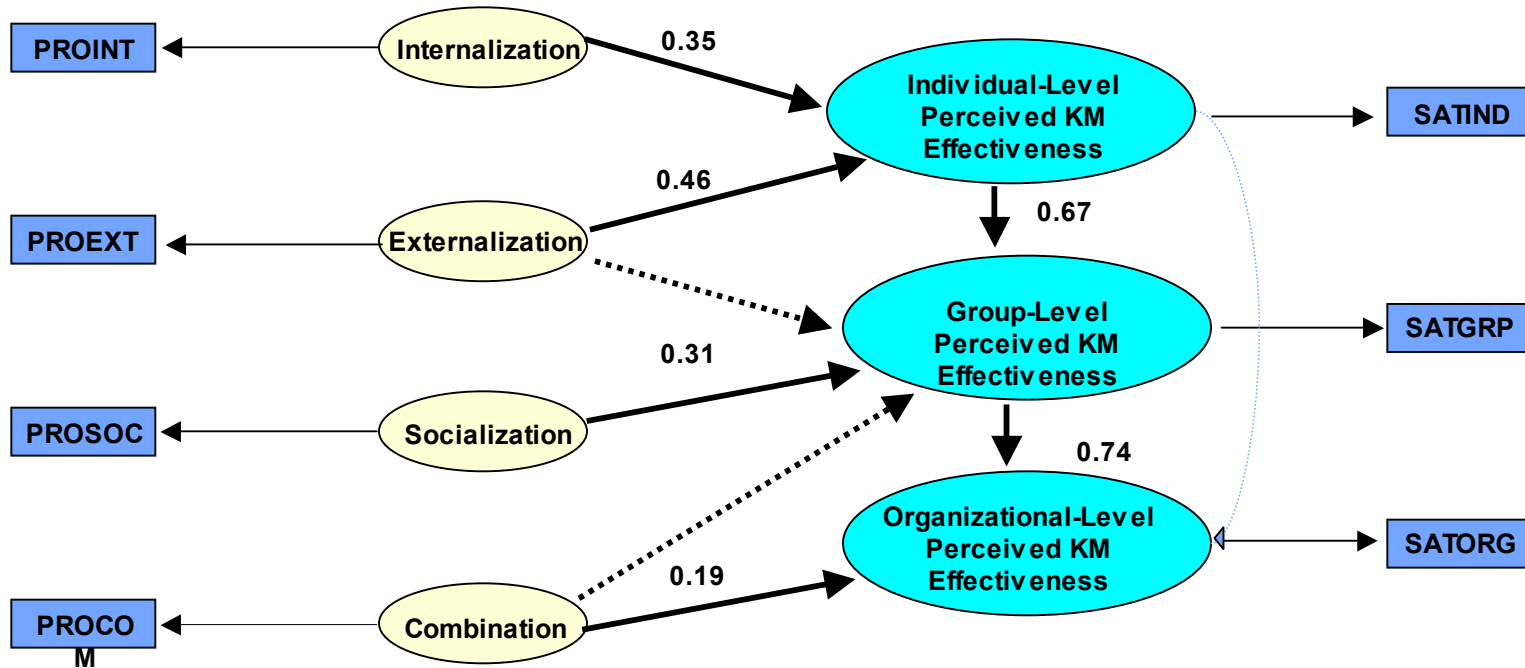
## **... and by three Items of measured**



---

- **Internalization**
  - OJT, Learning by doing, learning by observation
- **Externalization**
  - Problem solving, groupware collaboration, access to experts, modeling based on analogies and metaphors, capture and transfer of experts' knowledge
- **Combination of Information**
  - Web based access to data, Web pages databases information repositories, best practices, lessons learned
- **Socialization**
  - Cooperative projects across directories, mentors and transfer of knowledge, brainstorming capability, employee rotation across the area



# Emergent Structural Model from Sabherwal and Becerra-Fernandez



 Hypothesized and empirically supported  
 Hypothesized but not empirically supported

Rajiv Sabherwal and Irma Becerra-Fernandez.  
 (2003). An Empirical Study of the Effect of Knowledge  
 Management Process at Individual, Group, and Organizational  
 Levels. In *Decision Sciences* Volume 34 Number 2 Spring 2003  
 Printed in the USA 225-259



---

**How does this all relate to  
customer support?**



# The High Performance Computing Environment is Unconventional

---

**In the evolving world of HPC the customers are the pioneers developing new:**

- **platforms**
- **operating systems**
- **code**
- **scientific capabilities**
- **developments daily**



## **These customer are the experts ...**

---

**The answer book is not written**

**Problem solving requires the collaboration of these users and vendors**

**It is our job to facilitate this collaboration and disseminate the answers to enable future research**



# Exceptional Users Require Unconventional Support

---

- **Environmental Complexity**
  - Ever changing environment
- **Customer Expectations**
  - Require an expert at the other end & staff that work in the area and are familiar with the environment to provide support
- **Programmatic Need**
  - Need to use platforms and services at SNL as well as the other NNSA Labs
  - Need may be an immediate concern to national security
- **Remote Customer Base**
  - Support must be provided for all ASC users regardless of location\*

\*SNL - Sandia National Laboratories

\*NNSA - National Nuclear Security Agency

\*ASC - Advanced Simulation and Computing



---

# Designing High Performance Computing Customer Support



# How We Accomplish This Design

---

- **Determine customer needs**
  - Ask the customer
  - Ask the folks providing support now
- **Look at the success stories**
  - Lawrence Livermore National Laboratory sets a high bar to meet
  - Provide experts on the hot line who rotate between support and lab projects
- **Reward knowledge sharing**
  - Encourage individual user information dissemination
  - Facilitate user cooperation
- **Deliverables**
  - Support via email, telephone, browser
  - Platform specific information: Sample codes to follow
  - Browser accessible Knowledge base
  - Time independent





# Existing in a Changing Environment

---

## Develop a knowledge centered culture

- **Create a Socio-Technical environment**
  - Identifying the experts
  - Enable Problem Solving
  - Provide Tools
- **Capture Knowledge**
  - Capturing technology changes and user's experience
  - Capturing the solutions - Intrinsically
- **Disseminate Knowledge**
  - Web based shared repository
  - Consistent approach to access information among platform providers
  - On-line training



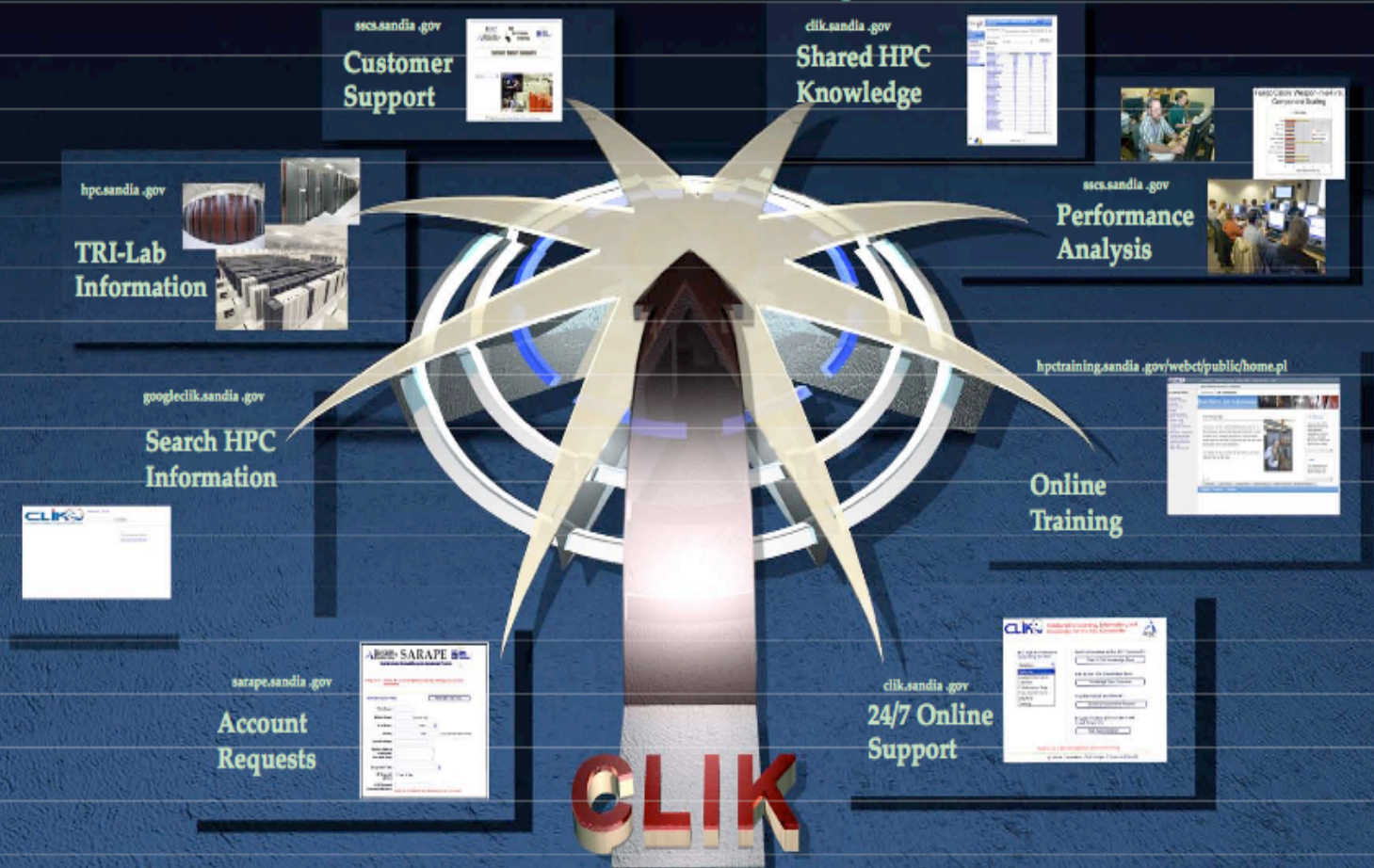
## Five Areas Chosen for Support

---

- **Technical support for use of platforms and applications**
  - Email
  - Shared Knowledge Base Repository
  - Telephone
- **Training**
  - Driver's License
  - Examples of Basic Platform Use
  - On-line
- **Web Accessible Account Requests**
  - Manual process exists but not directly accessible to the user
- **Custom Life Time Support**
  - For developers
  - Includes code tuning and debugging
- **Web Pages Common to Other Resource Sites**
  - Provides a familiar location for resource information

# Sandia Scientific Computing Support High Performance Computing

CLIK . . . shared HPC Knowledge



Collaborative Learning, Information, and Knowledge





# Initiated as a Tool to Provide Customer Support to ASC High Performance Computer Users

---



## **Integrates with:**

- **Remote and local users including the Tri Labs, the NWC sites and ASC Partners**
- **Help-desks as SNL, LLNL and LANL**
- **Experts outside of this arena**





# **CLIK is Custom Code Designed to Integrate with many Corporate Codes, Processes, and Procedures**

---

- **Kerberos and Cross Cell Authorization for Security**
- **MetaGroups Utility for Access Control**
- **NWIS for User Identification**
- **Reverse Proxy for External Access**
- **General Cold Fusion Code Modules**
- **Corporate sol Servers and Database**
- **Analysts Codes - DART, SourceForge**
- **Corporate Email and Majordomo Reflector Lists**



## **Custom Tool for Collaborative Learning, Information and Knowledge: CLIK**

---

- **Custom Code Designed to Integrate with many Corporate Codes, Processes, and Procedures**
- **Integrates Web Based Information Providing HPC Knowledge From one Source - Using Google**
- **Intrinsic - Uses standard email and does not require the consultants to take an extra step**
- **Entries to be added to KB can be submitted directly from the Technical Assistance Request form**
- **Anyone may submit an entry**

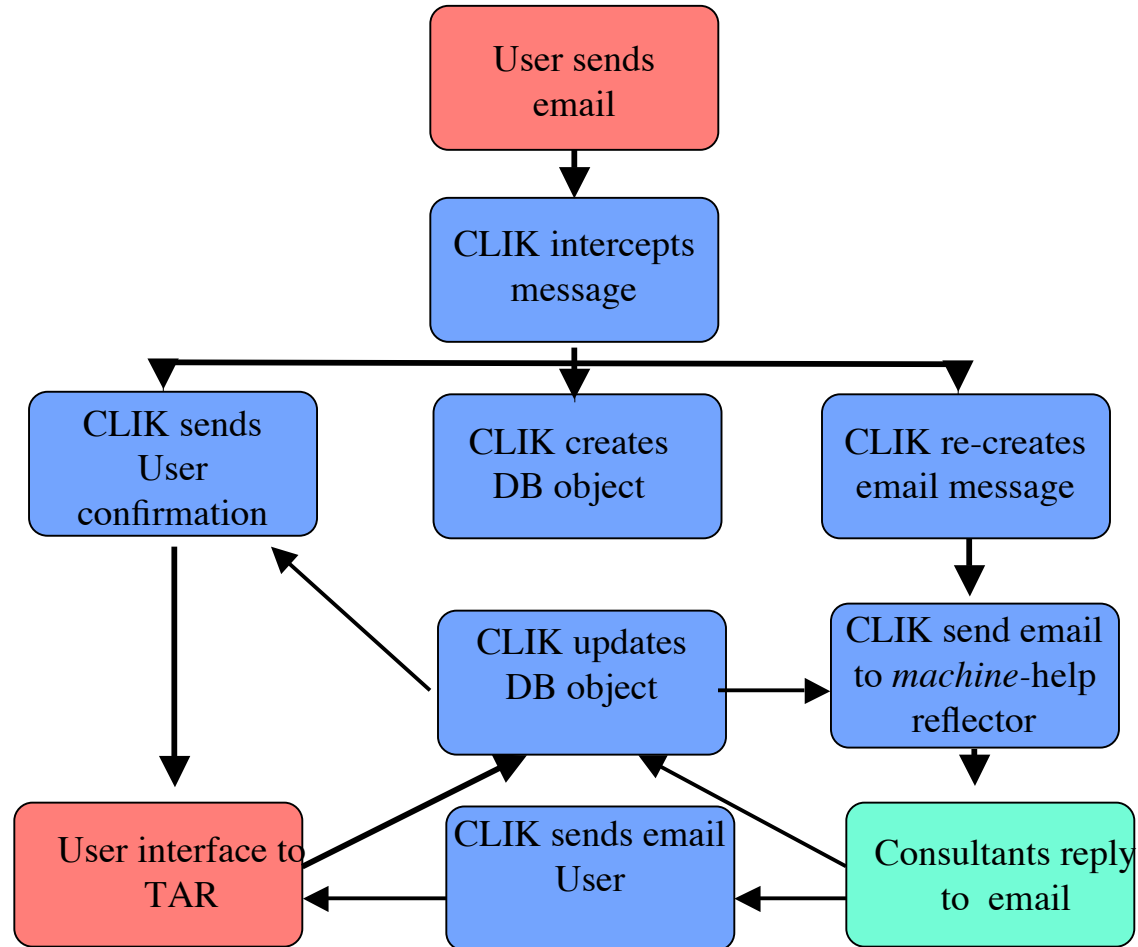


## **CLIK Integrates Web Based Information Providing HPC Knowledge From one Source**

- **There are currently .5M entries in our Knowledge Base - Expanding with Google cluster at this time**
- **These are comprised of Labs (LANL, LLNL, SNL), Vendors (Cray), Local Sites (seacas, cth, sc-admin, etc)**
- **Also provides information for other HPC services: Training, Calendars, Collaboration Location, Wiki (In Dev)**



# Process for User Request for Technical Assistance via email to *machine-help@sandia.gov*







---

## What do the User's think?



## Some like it, some hate it

---

- **Those that hate it:**
  - **System Admins - Consultants**
  - **Are usually on new, immature systems, that are still being developed**
  - **With unique problems solving that will not repeat**
  - **Respond to a high volume of TARs (20+ daily)**
  - **Are frustrated with a tool that looks like email but isn't**
- **Those that like it:**
  - **Have been using CLIK for a period of time and are familiar with it**
  - **Need to track a thread of information in one location**
  - **Have repeatable Technical Assistance Requests**
  - **Use the web interface**



# User Survey of CLIK Support

---

Number of Surveys sent: 26 n=8, 30% Response Rate,  
Scale 1=low 6=high

2. ...rate the level of difficulty or confusion you experienced with this support tool? **1.375**
3. ...rate the level of support that you received from the consultants using this tool. **5.3**
7. ...Do you find CLIK useful? **4 Yes, 3 No Answer, 1 Same as old system**
8. Do you find CLIK convenient or an impediment to your work?  
**7 Convenient, 1 Neither**



## Technical Assistance Request (TAR)



ID: TAR06-Mar-00799

**Requestor:** Amalia R Black

**Location:** Sandia National Laboratories

**Phone:** (505) 845-8057

**E-mail:** "Amalia R. Black" <arblack@sandia.gov>

**Designated CLIK Expert?**  Yes  No

**TAR Status:** Open

[Add Notation](#) | [Send Email](#) | [Telephone/Other](#) | [Transfer TAR](#) | [Consult Expert](#) | [Close TAR](#)

[Knowledge Base Submittals \(based on this TAR\)](#) | [Search Knowledge Base Submittals](#)

[Refresh All](#)

[TAR History](#) | [Initial Request](#) | [Notations](#) | [Consultations](#)

**Current Help Group:**

wg-clik-redstorm

**Last Action Taken:**

Consultation requested

**By:**

Ruth Villegas

Apr-07-06 Fri 02:50 PM

**Notations:** 0

**Consultations:** 2

**KB Submittals:** 0

### ■ TAR History

[\[Reverse order\]](#)

**E-mail response:** I'm so glad I used this thread, rather than sending email privately to Amalia and Stefan about the first hang. A redstorm-helper pointed me to an existing Cray problem report that explains a hang following a dead node. Yet another redstorm-helper has identified the fix. We'll have to wait for an OS upgrade to get the fix, but this is progress, I think.  
Sue

**By:** Kelly, Suzanne M

**Date:** Mar-29-06 Wed 10:44 AM

**E-mail response:** Stefan,  
> signal 29 is a power failure  
According to the Linux include files, 29 translates to SIGIO. The use of signal 29 is hold-over from ASCII Red,



## The Red Storm Report Card

---

- **GREAT! Response from redstorm-help**
- **- Our issues are receiving attention**
- **- great people; very helpful**
- **- No comment**
- **- there was a module change without any notification that had a major impact on our codes.**
- **- Same comments as last time about the staff. I haven't had enough time with the documentation to see if it is getting better.**



# Comments from Survey of User Support

---

- **Additional Comments**
- **\*\*Looking forward to training session next week.**
- **\*\*To be expected for a new computer.**
- **\*\*User support has been fantastic on all levels.**
- **\*\*Support staff is very good, very responsive, and very helpful; but more documentation would be helpful of tools like zcp and dsacp.**
- **\*\* Issues have mostly received attention**
- **\*\*Haven't used, the Presto team has responded to my questions concerning I/O, but I haven't dealt with any other support people at this point.**
- **\*\*Very quick turnaround; superbly knowledgeable/helpful people.**



# The Knowledge Framework

---

## Knowledge:

- **Collaborative, does not occur in isolation - Salomon**
- **Situated cognition created at the time and place -Hutchins**
- **Socio-technical created out of interaction - Lipnak And Stamps**
- **Created, captured and disseminated - Nonaka**
- **Retrieved from systems - Perkins**
- **Artifacts as highly inter-dependant Knowledge Ecologies - enhance research innovation capability - Igel & Numprasertchai**
- **Resulting Perceived Knowledge benefits: individual, group and organization**



# Future

---

## Incorporate

- “full” email capability
- Jabber to enable communication
- Wiki to enable documentation





---

**End of Presentation**