DOD & Federal
KM
Symposium
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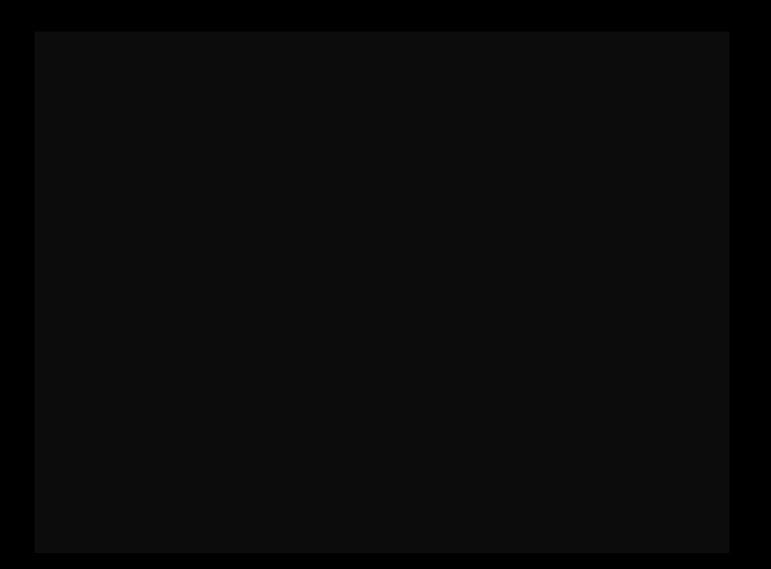# Searching for Intelligent KM in Space: Insights from NASA

Dr. Edward Rogers, NASA

DISA

Exploring *the* Future

Searching for Intelligent KM

Ed Rogers

What We Don't Know

Two Papers are the Basis for this Talk

Some mistakes in a KM program are inevitable; after all, nothing is ever perfect. But with rich historical examples to learn from, and some proven insights documented in numerous books and studies, why is it that some of the biggest KM mistakes are repeated time and time again? Here, Dr Ed Rogers draws parallels with current KM practices and the direction given by Nobel Prize-winning economist Freidrich Hayek.

AVOIDING THE PRETENSE OF KNOWLEDGE MANAGEMENT

Three steps to being a smarter organization

By Dr Ed Rogers, chief knowledge officer, NASA Goddard Space Flight Center

Dr Ed Rogers is chief knowledge officer at the NASA Goddard Space Flight Center where he has taken a KM approach built on six learning practices and supported by appropriate infrastructure.

When Friedrich Hayek received the Nobel Prize for Economics in 1974, he delivered an acceptance speech on the "The pretence of knowledge."
In this article I will explain how we can benefit by revisiting Professor Hayek's essay and applying some of the lessons learned from economics to modern KM.

Many KM approaches assume that to improve efficiency and effectiveness an organization must capture knowledge from workers. Often knowledge capture is portrayed as being part of a robust KM system that involves creating, capturing, sharing, and applying knowledge. Listen to a KM consultant, architect or guru today and sooner or later you will hear the word "capture". Many times it's the main benefit claim such as:
• "Our KM system will be assembled by capturing knowledge"; or
• "The purpose of this KM system is to efficiently capture knowledge from across the organization".

The premise of these claims is that if knowledge is the resource of the century, which alone can build sustained competitive advantage, shouldn't we be capturing it so we can compete in today's global environment? Drawing inspiration from Hayek, I label this claim, "The Pretense of KM".

Mistaken purposes
If capturing knowledge from workers can really help an organization perform better, then it raises the question of who is capturing knowledge from whom? Often it's simply other individuals gaining

access to knowledge extracted from those less empowered to make use of it themselves. If you've hired smart people they'll figure out that this is a good and bad idea. No matter how many papers and studies are generated showing the impact of people factors in KM systems, there are still vendors hawking knowledge scraping systems to capture organizational knowledge based on the assumption that no one will notice their missing knowledge. People are no more willing to give up their tacit knowledge to the collective company than they are willing to donate body parts – unless of course they are ideal type of employees portrayed in the movie *The Island*.

We should have already learned this lesson courtesy of Hayek. If KM experts applied a little of their own rhetoric to themselves, they would notice that knowledge organizations operate efficiently as open market systems where the information and knowledge flow naturally.

Defective interventions
Even worse things can happen when knowledge capture gets attention as an intervention tactic to mitigate damage from downsizing efforts; for example, a KM system will allow the organization to downsize without losing organizational knowledge. The sales pitch for these KM systems is, "This system will allow you to keep the knowledge without having to keep the people." If this made sense, then why limit the capture to downsizing? The more people you can strip of their knowledge and let go, the more you improve the bottom line. This mentality is not unlike the foolish miser who fed his donkey less food each day until one day it died, causing the man to lament: "Only a few more days and I would have had it living on nothing!"

BRIEFINGS

NEW RESEARCH, IDEAS AND TECHNIQUES

The top 10 KM myths

By Ed Rogers, chief knowledge officer, NASA Goddard Space Flight Center

Ed Rogers is the chief knowledge officer at the NASA Goddard Space Flight Center where he has taken a KM approach built on six learning practices supported by appropriate infrastructure.

Knowledge management is often said to be about not repeating mistakes, using the experiences of previous efforts to maximize efficiency on the latest project. But what of learning the basics of KM itself? There are many typical misconceptions and mistakes made, from the over-emphasis on technology and software, to the suggestion that "anybody can do KM." Here, Ed Rogers presents his top 10 myths of KM, the actual reality surrounding each myth, and potential solutions for each.

10. Culture change can be mandated from the top
Myth: Writing reports, hiring consultants and issuing directives or slogan campaigns will significantly change behavior.

Fact: Behavior is modeled not dictated.

You can: Find more ways for people to see their leaders leading, making good decisions and reasons to have faith in their future to apply themselves within their

communities. Get senior leaders involved in the training and development of personnel by sharing.

9. Collaboration effort can be "purchased" or "sharing can be "rewarded"
Myth: Offering $50 in cash, award plaques or loud clapping will make otherwise uncooperative people collaborate.

Fact: Collaboration is a conscious choice based more on perceptions of non-tangible benefits and learned reciprocity than token rewards. Collaboration is usually widespread at the local work level.

You can: Look for ways to avoid discouraging natural collaboration among, programs and departments and try not to trivialize sharing with simplistic band-aids.

8. Knowledge management efforts can be outsourced
Myth: Large organizations believe they can solve KM with the right contractor and tool suite.

Fact: Adding more tools can actually exacerbate a lack of collaboration by reducing learning. The message of tools can be dehumanizing.

You Can: Designate a senior executive champion for KM and establish an outside board of KM advisors to keep the focus on meaningful, long-term methods instead of quick fixes. Assume it will take hard work and commitment of leaders.

7. Anybody (who isn't busy) can do knowledge management
Myth: KM is a good activity for people who are in between assignments or in need of a rotational detail.

Fact: People who don't understand KM make most of the same predictable mistakes the group before them made. Little learning occurs. Hit, miss, restart efforts build cynicism towards KM.

You can: Provide a plan with a consistent direction of KM efforts to make progress integrating KM with risk management, information management, safety, engineering and project management processes.
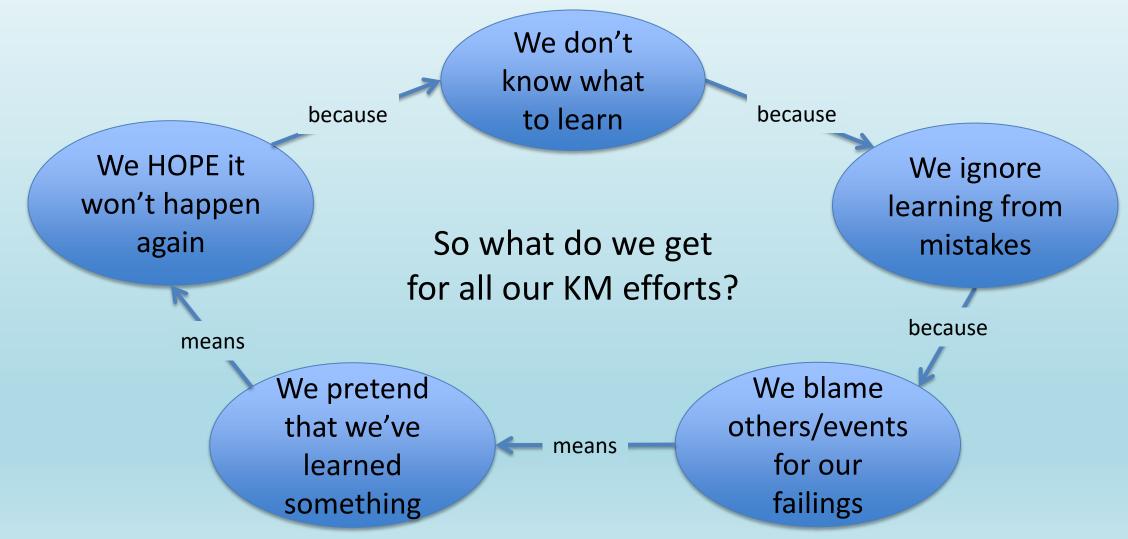
6. Knowledge management can be solved by buying the right software
Myth: Buying a software tool or developing one from scratch will solve the loss of knowledge and make people share.

What Happens When We Don't Learn?

We don't know what to learn

because

We HOPE it won't happen again

because

We ignore learning from mistakes

So what do we get for all our KM efforts?

because

means

We pretend that we've learned something

means

We blame others/events for our failings

What you do at Initech is, you take
the specifications from the customers...

Five Big Reasons Why We Don't Learn the Important Lessons

1. We document (LL) rather than discuss
2. We focus on the technical root causes
3. We ignore the organizational lessons
4. We let people write their own histories
5. We don't understand our reasons for success

Some Examples to Consider

1. Tenerife Airline Disaster: 1977

2. Bhopal India Tragedy: 1984

3. Challenger Accident: 1986

NOTE: These were 30-40 years ago!

Tenerife Air Disaster: March 27, 1977

- Two fully laden 747 Jumbo Jets collide on the runway at Tenerife Airport
  - The KLM jet was trying to take off and the Pan Am jet was taxi-ing off the runway
- 583 people died and 61 people survived (all from the Pan Am plane)

Computer generated graphic depicting how the airplanes collided.

The Organizational Causes

- The Pan Am jet failed to exit the runway at the point indicated and failed to inform the tower that they were in fact still on the runway

- The KLM crew were facing a mandatory crew rest if they didn't take off; the KLM captain concluded on his own that Pan Am 'must be clear now'

- The tower failed to clearly communicate and were perhaps pre-occupied with a football match being shown on television; nor were they accustomed to dealing with many large jumbo jets at one time in the small airport

Neither plane was scheduled to be at Tenerife; they had both been diverted from Las Palmas to Tenerife due to a bomb threat at the main airport.

Bhopal, India: December 2, 1984

Union Carbide Plant: Bhopal, India

- A leak of methyl isocyanate gas spread into a neighborhood

- Consequences:
  - An estimated 3000 people died from gas inhalation with another 5000 dying later
  - Many thousands injured, disabled or died prematurely
  - As many as 500,000 people affected

The Organizational Causes

- Marginal understanding of chemical hazards and plant design by operating staff
- Local encouragement of development near plant
- "Get it done" attitude—when in doubt 'go ahead' mgmt.
- No integrated risk mgmt. connecting the individual actions of turning off multiple safety systems
- Reduced safety staff did not coordinate their actions

The Challenger Space Shuttle: January 28, 1986

The Rogers Commission, which investigated the incident, determined:

- The SRB joint failed when jet flames burned through both o-rings in the joint
- NASA had long known about recurrent damage to o-rings
- Increasing levels of o-ring damage had been tolerated over time
  - Based upon the rationale that "nothing bad has happened yet" (prove failure first)
  - Management unable to hear engineers
  - Engineers unable to communicate message succinctly to management

Common Reasons for Failure

- Complacency due to prior superior safety performance (everything is going great!)
- Normalizing safety critical requirements where tolerance rises to equal prior experience levels
- Ineffective Risk Assessments of systems allowing small catastrophic risks to be accepted
- Reversing the Burden of Proof when evaluating safety of operations to "prove it will fail" or go ahead
- Employees Not Speaking Freely of their safety concerns or not being heard (no action taken)
- Business Pressures at odds especially with unclear safety priorities and hard specific business goals
- Failure to Learn and apply lessons for improving our culture based on prior failures or close-calls

So What Did We Really Learn?

- We learned nothing about 747 operations from the 1977 Tenerife Air Disaster. Nothing.
  - Every management lesson was also known.
- We learned no new chemical processes from the 1984 Bhopal Tragedy. Nothing.
  - Every management lesson was also known.
- We learned nothing about the physics of O-rings from the 1986 Challenger Accident. Nothing.
  - Every management lesson was also known.

So How Can KM Help Us Get Smarter ?

SEIZE UP or EXCEL FORWARD

The "Policy" View
- Capture
- Collect
- Categorize
- Store
- Search

SEIZE (C's)

The "User" View
- Experience
- Exchange
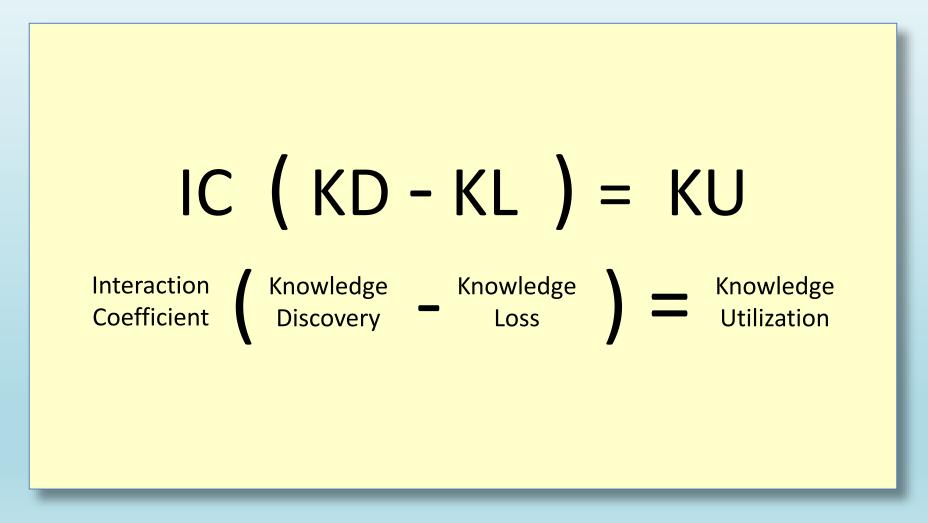- Collaborate
- Extend
- Learn

EXCEL

What We Were Led to Believe…
(The Pretense of KM)

- Knowledge Flows Can Be Controlled

- Centralized Knowledge is More Useful

- Collection Leads to Increased Utilization

- Tacit Knowledge Can Be Extracted from People

- Technology Will Save Us !
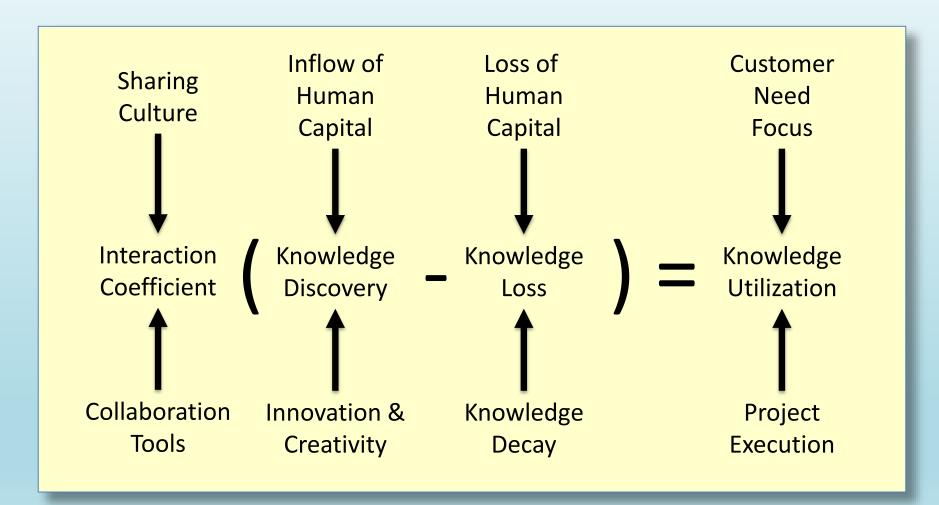
- Right Info, Right People, Right Time is Key !

Three Rights Make a Wrong

- Good idea for process control operations
  - Air Traffic Control
  - Military Logistics Operations
- Bad Idea for Innovation and Research
  - Don't (Can't Know) What is "RIGHT"
  - Need Market Mechanism to Move Knowledge
  - Stored Knowledge is "Out of Circulation"
  - Ignores Interactive Co-efficient of Production

The Organizational Knowledge Equation

$$IC \left(KD - KL \right) = KU$$

Interaction Coefficient $\left($ Knowledge Discovery $-$ Knowledge Loss $\right) =$ Knowledge Utilization

The Knowledge Utilization Equation

Sharing Culture

↓

Interaction Coefficient

↑

Collaboration Tools

(

Inflow of Human Capital

↓

Knowledge Discovery

↑

Innovation & Creativity

−

Loss of Human Capital

↓

Knowledge Loss

↑

Knowledge Decay

) =

Customer Need Focus

↓

Knowledge Utilization

↑

Project Execution

So How Can a KM Program Help?

- Increase the Co-Efficient
  - Increase Internal Organizational Sharing
  - Facilitate Collaboration and Reward It
- Bring in Creative Talent
  - Allow New to Affect the Old
  - Make Room for Creativity and Innovation
- Learn the Lessons from Execution
  - Mistakes
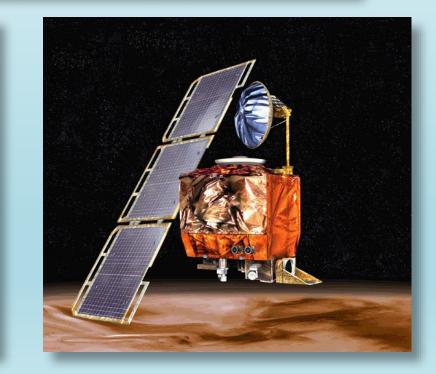 - Successes

What Does a CKO Actually Do?

- Uncover the lessons we need to learn
  - What actually happened and why?
  - How were the decisions actually made?
- Package the lessons to be told and re-told
  - Get the story line straight and avoid the myths
  - Make it a tell-able story/case study
- Justify the 'why' we do things
  - Give rationale to process and procedure
  - Allow change to happen (improvements)

MCO: Is that in Metric or English?

- Inadequate systems engineering
  - Lack of a mission systems engineer during operations (transit to Mars)
- Inadequate 'what if' thinking and lack of a 'fault tree' type of analysis
  - Lack of identification of critical elements such as transition from development to operations
- Unclear project roles and responsibilities
  - Lack of sufficient training, clear authority and responsibility among project and contractors

What happened?

- Launched on Dec. 11, 1998 MCO traveled to Mars and entered Martian atmosphere on Sept. 23, 1999. Entering too low it probably crashed on the surface.
- Software error attributed to the wrong units (Metric vs English) being used in a course correction formula sent the spacecraft off course during transit to Mars.
- Multiple course corrections were made without asking why it was drifting off course.
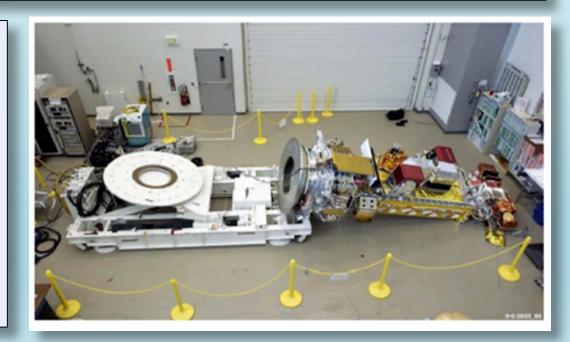
NOAA N': Some Missing Bolts

- Contractor moved operations to California from New York
- Long term program near the end of its life span
- Repetitive work, done before (multiple satellites of this configuration)
- Lack of clear and articulate communication that demands specific answers
- Complacency about following rules and procedure
- Reduced safety staffing levels

What happened?

- In performing a move to the nearly done satellite on a Saturday morning, the bolts were not in place to hold the satellite while the cart was tilted and it fell on to the floor
- Lack of probing and questioning by personnel
- Failure to follow procedures

CALIPSO: Prove It Will Fail

- ## Complex organizational structure difficult to reconcile
  - Two centers, two countries, two contractors, two types of contracts, two directions from HQ
- ## Dismissal of dissenting opinions in favor of progress and partnership harmony
  - French design not consistent with NASA design standards
- ## Successful mission that left casualties on the ground
  - People left the Agency, multiple project managers, stressed lives
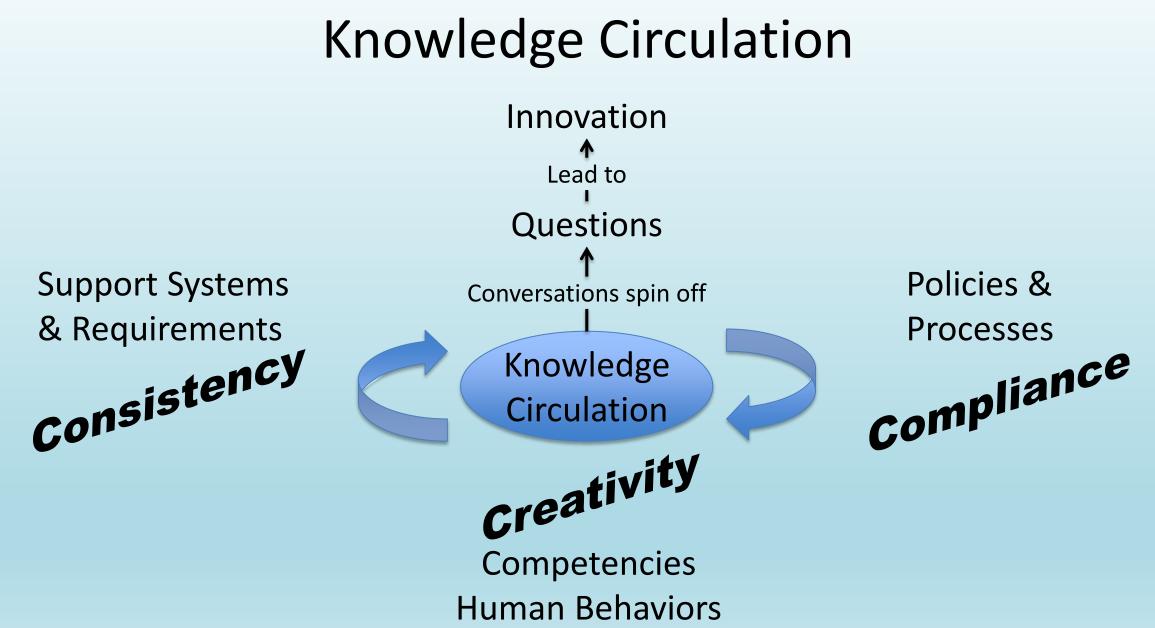
What happened?

- A disagreement about the design of the propulsion system fittings though technically easy to solve proved impossible to solve organizationally. Unclear who owned the safety requirements
- GSFC Safety and Mission Assurance asked to 'prove it has failed' to justify their opinion
- $10 Million spent on 'non-problem'

Clarify the Role for the CKO

- Knowledge is Useful When in Circulation
  - Make it Flow
  - Give it Meaning (context)
- Build Learning Practices Supported by IT
  - Keep the Focus on Learning
  - Let Learning Drive IT Requirements
- Lead by Example
  - Allow Leaders Opportunity to Model Sharing
  - Get Mistakes on the Table to Build Openness

Knowledge Circulation

Innovation

↑

Lead to

Questions

↑

Conversations spin off

Support Systems & Requirements

Consistency

Knowledge Circulation

Policies & Processes

Compliance

Creativity

Competencies
Human Behaviors

Enhancing Learning

Personal Reflection ← articulated through — What I know from experience — enriched by → Job Rotations

Case Studies ← engaged through — What everybody can know

Who I know and what they know — learning during → Case-Based Training

What everybody can know — referenced in → Lessons Learned

Who I know and what they know — broadened through → Sharing Workshops

A Pause and Learn…

… a method for reflecting and transferring individual lessons from a specific project event among fellow team members.

Team members meet behind closed doors, take off their official "hats" for a brief period, and look back on a recent event to gain a more thorough understanding of what has happened, and why.

What Good is a CKO?

- Not needed for technical improvements
- Not needed for LL policy documentation
- Not needed for independent safety backup
- Not needed to investigate mishaps

- NEEDED to address organizational lapses
- NEEDED to address management failings
- NEEDED to address learning from decisions
- NEEDED to address reasons for success

Know the Reasons for Our Success

Responsible Leadership

Rigorous Engineering

Open Discussion & Debate

Requirements Management

Risk Management

How to be an Effective CKO

- Understand the Story
  - I use a concept mapping technique
  - Important thing is to GET THE STORY
- Understand How the Decisions were Made
  - Not just second guessing (using hind-sight)
  - Know the context, process, and rationale
- Speak to the Organizational Issues
  - Everyone knows about them anyway
  - Gain credibility and you will learn much more

What We Have Here Is…
Failure to Communicate

Columbia Didn't Fail Them: We Did

Fit KM Approach to the Organization

"Your Knowledge Management Program should be like a good pair of shoes—it should fit your organization well and it should take you someplace interesting."

Exploring the Future

Knowledge Will Take Us There

Ed Rogers

NASA