



Tribal Knowledge: Engineers Share Knowledge

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What Makes Boeing Special?

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- Product life cycle is 40-plus years
- 777 is our new airplane
 - Its' first flight was almost ~15 years ago
- Forced into a longer view of time
 - Just received technical service query for an A-20 – that's an airplane that served in World War II
- Technical workforce is moving from long-term “Masters” to nearer-term “Padawans”
 - Requires quicker, more efficient and accurate access to knowledge

A Few Statistics

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- Knowledge workers spend 60 percent of their time looking for information to do their work [\[1\]](#)
- 70% of the working population will be eligible for retirement within the next 4 years [\[2\]](#)

So how does a company like Boeing address a situation of this magnitude?

We eat the elephant one bite at a time!

[\[1\]](#) McCampbell, Atefeh Sadri, Linda Moorhead Clare, Scott Howard Gitters, "Knowledge management: the new challenge for the 21st century"; Journal of Knowledge Management; Sep 1999, Vol. 3, Iss. 3, Page: 172 – 179

[\[2\]](#) Holtz-EakinBaby, Douglas; Boomers' Retirement Prospects: An Overview; November 2003

Who and What is Flight Deck Engineering?

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- Solve issues with the human aspects of flying the machine and the systems that pilots touch
 - Flight Crew Operations Integration
 - Research and Development
 - Design
- Important safety and operational responsibility for the tens of thousands of airplanes in service
- Concern about communicating with the appropriate stakeholders, getting the right answer, and making certain that the answers are documented

Mandates for Success

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Issue of capturing, retaining, and retrieving information is critical to the long-term success of our Flight Deck organization

- First mandate was to design a system where new Boeing engineers ten years from now could go and find the information they needed to conduct their work
- Second mandate was that this new employee would be able to bet their paycheck on the accuracy of the information they found

The Problem

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- Individualism Diffusion – the antithesis of knowledge management
 - Everybody does their own organizing
 - No agreed upon hierarchy of folders
 - No agreed upon naming convention for files
 - Inconsistent templates

- Where to find commonality among the members of the group?
 - Servers
 - Outlook folders

Getting Started

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- Must agree upon folder naming convention and file structure
- Start with a pilot project
 - Flight Crew Operations Integration (FCOI) (~25 people)
- Create several repositories to capture previous design decisions, graphics, working knowledge and presentations
 - varying levels of confidence

What Needs to Change?

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- Determine that **focus** of the group had to shift from individual learning/organizing to organizational learning/organizing
- Understand that reliable knowledge management could **reduce** mistakes related to inconsistent design decisions
- Acknowledgment that knowledge management would **require** reliable and repeatable processes; therefore, we must capture, deploy, and monitor our processes to ensure accuracy

High Level Look at Methodology

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- Review individual Outlook folders
- Identify commonalities in organization of data
- Set up repository to follow folder structure
- Gain approval by technical people on accuracy and necessity of documents
- Migrate documents to repository and place value on those documents

Results of Folder Review

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- Most people in the group organized around Boeing model and function on the airplane
- Determined that the best way to organize was to use Boeing model for top folder
- Functions are captured in an industry standard called Airline Transportation Association chapters
 - These were used for the next two levels of the taxonomy

Development of Repositories

Issue: people believe what they read because they believe the author was qualified to write the document

- Determine how to assure accuracy of what would be retained in the repository
- Move from a personalization strategy to a process that validated the accuracy of the documents being saved
- Create an approval board to assure the validity of the information and the placement within the folder structure

Development of Repositories

Issue: Should all documents go through approval process?

- Establish a confidence level for each of the repositories
- “Design decision” repository would have an approval board and therefore have high confidence in the accuracy of the information
- “Working knowledge” repository would be a place where information would be stored that was of value, but not necessarily validated for accuracy
- Graphics and presentation repositories have a medium confidence

Development of Repositories

Issue: assure that these repositories would be able to stand the test of time

- Establish economic value that would validate the need for maintenance
- Determine a dollar value is associated with each document
 - Formula of value is 8 hours per page times \$130 an hour burdened rate for engineering
 - Aggregate values to establish a total asset value for the knowledge asset

Testing the Process

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- **Issue:** many of the documents could be placed in numerous folders because there was more than just a single issue documented
 - Work with an individual subject matter expert on placement
- **Issue:** the engineers had a difficult time agreeing on where the document should be placed
 - Not allow debate of the placement decision unless there was a compelling reason to do so
- **Issue:** No multiple copies of the same document in the repository (single source of data only)
 - Hyperlink within the repository to the original document if multiple locations are required

Paradigm Shift in Decision-Making

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- Previously, formal decision-making process – use of formal decision-making documents and processes
- Today, decisions are agreed upon in emails and not formally documented in the same way
- Moved from formal structured to informal unstructured over time
- Shift in decision-making is good because it speeds up the process
- However, it is more difficult to locate specific decisions and ensure appropriate stakeholders were involved

Finding the Data

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Issue: how to find documents out in the larger world of servers, emails and filing cabinets

- A lot of the information from the past ten years resides in emails – both conversations (threads) and documents attached to emails
- Conducted a search for tools to assist with search – result was the discovery of the Email Intelligence Platform™ by Clearwell Systems
- System allows you to feed Outlook files into the system, which then quickly crawls and indexes the emails

Benefits of Email Intelligence Platform

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- Rapidly capture and accurately categorize Flight Deck knowledge found in emails and their attachments,
- Provide simple and intuitive access to Flight Deck Knowledge for existing and new employees,
- Accomplish KM capture in a cost effective and efficient manner
- Establish repeatable process for future KM capture needs

Bottom line – Clearwell discovers, organizes, and analyzes the information captured in email

Flight Deck Email Capture Methodology

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- Method for using the Clearwell System was first to copy Outlook folders from individuals' computers and feed them into the system
- System then crawled, indexed and associated with keywords, which were established from our taxonomy
- Once PST files captured, then individuals asked for issues they wanted researched to see if information could be found
- Using system in stand alone, library scenario now
 - In future, will have individuals archive their PST files directly to Clearwell server

System Test and Results

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- A new employee, who had little technical knowledge, was posed a highly technical question to see if he could find the answer in the captured email
 - In less than 45 minutes, information was identified and question answered
 - Additionally, documents valued at over \$500,000, which were actual test flight documents validating the answer, were found (these documents, although they could probably be found somewhere else, were imbedded in email)
 - Migrated document into the repository for future use

Benefits of Clearwell for Flight Deck

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- System allows us to capture and store informal unstructured decisions, assuring employees of today and in the future have quick, accurate access to vital information
- System uses our taxonomy in organizing email, which provides a consistent classification technique
- System indexes emails and removes all duplication of content
- System offers relevance ranking and hit highlighting – both of these features make it easier to identify if an email or thread of emails are relevant to the topic being researched

Concerns

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- Boeing has major concerns about privacy, retention of information, and security of information.
- During pilot the following issues had to be considered:
 - International Trade and Arms Regulations (ITAR)
 - Issues of proprietary information must be protected and restricted to authorized viewers only (new programs, military programs, other proprietary information)
 - Personal information must be sorted out

Who Needs to Be Involved?

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- Identified groups within Boeing who could have issues to be addressed for moving forward with pilot – these groups include:
 - Information Protection
 - Information Technology
 - Legal
 - Procurement
 - Records and Information Management
 - Email IT architects

Other Major Initiative

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- In addition to capturing, storing and retrieving information and knowledge there are several other initiatives happening at Boeing
- Lean Engineering is a major initiative
 - Must examine processes and deliverable
 - Reduce waste – rework and queue time
 - Capture current state of processes
 - Create future state
 - Make visible processes via Visio and Work Instructions

Benefits of Initiatives

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- Organizational memory, in the form of the different repositories, is stored and maintained for future use
- Knowledge management represents an effort to avoid mistakes and is an insurance policy against the loss of that organizational memory in the future
- Addressing legal, security and privacy concerns by working with different stakeholders within the company assure compliance with each set of requirements

Metrics of Success

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- Underlying theme for identifying metrics is to provide processes for seamless and timely transfer of and access to pertinent information
- Metrics to include:
 - Reduction of errors in issue resolution
 - Define commonality of folder structures and adherence to that commonality
 - Increase in reuse and efficiency of knowledge
 - Increase in accuracy of information captured
 - Usability and retrieval of information

Future Timeline

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- Conclusion of pilot is targeted for December 1, 2006.
- Goal is to have the tools/toolkit identified and tested then move into implementation of continuously capturing and storing knowledge and information
- Next test the tools and toolkit on the other groups within Flight Deck – moving from a subset of about 25 people to the entire group of 230 people
- Help to understand if tools are robust enough to capture, store and retrieve information as well as capture, document and deploy processes

Final Thought

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When completed, the work with Flight Deck will be a replicable system for knowledge and process management that can be deployed in other segments of the corporation

Questions?

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