

The rise and potential fall of the
aerospace industry: A study of the
impacts of the baby boomers and a
proposed solution for bridging the
knowledge gap between generations

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Integrative Thesis

[Agenda]

- Introduction and Lessons Learned
- Prelude to the Problem
 - Post WWII Culture
 - Onset of the Cold War and the Emergence of the Aerospace Industry
- The Ramification
 - Baby Boomer Retirement Statistics
 - Industry Sentiment
- Tackling the Problem
 - How people learn
 - Knowledge management best practices
- Solution: KMInfoShare
 - Product Definition
 - Security
 - Business Model
 - Implementation
 - System Architecture
 - Website Demo
 - Product Website
- Summary

[Introduction]

- What is the problem?
 - Staggering Statistics
- Why study this problem?
 - Personal experience
- What is the solution?
 - No one right answer

[Lessons Learned]

- Product Design & Development Class when
 - Surveys
 - Pre-survey release for troubleshooting
- Project management experiences
 - Risk analysis and mitigation
 - Early survey problems
- Business classes including Marketing, Product Design, Business Operations and Law
 - Developed product requirements, business model, websites and business insertion plan
- SE classes including Systems Architecture, Systems Engineering, Lean, and Quality
 - Developed product life cycle and verification and architecture as well as product integration.
- Aerospace industry experience
 - Developed and diagnosed problem as well as postulated solution

Comprehensive approach taken to develop and execute thesis

[Post WWII Expansion and US Sentiment]

- Single largest period of growth in US history
 - 77 million newborns
 - 'Golden Age of Capitalism'
 - Living the American Dream

[Onset of the Cold War]

- Political Unrest
 - Eastern European weakness
 - Germany left in shambles
 - Countries like France left to rebuild their infrastructure
 - Rise in Communism in Western European countries
 - US growth and Soviet Union expansion

Tensions rose between the Soviet Union and the rest of the civilized world.
'Us against them mentality'

[Cold War Philosophy]

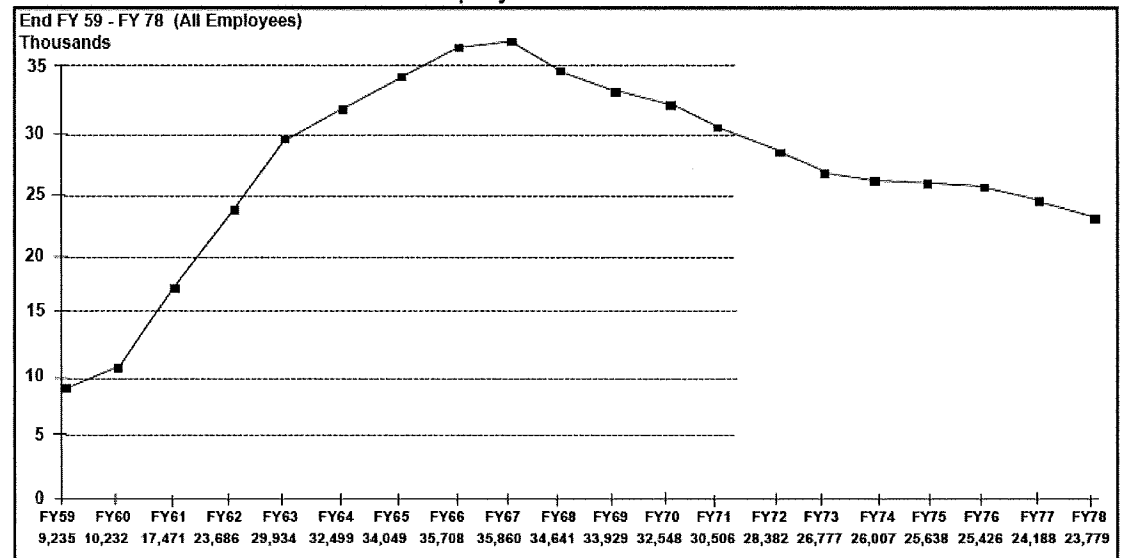
- Cold War characterized by two ideas
 - Fear
 - US fearful of WWII as the fight against communism
 - Something as simple as the color red ignited various emotions
 - Armed forces were not the soldiers
 - Controlled by spies and espionage
 - Dominance
 - Fears led to political mind-games between the two countries
 - Victories were characterized by shows of dominance in every aspect of culture
 - Sporting events – Olympics
 - Technological Achievements – Space Exploration

Emergence of the Aerospace Industry in Space

- Space race embodied the Cold War mentality and need to show dominance in all aspects of interaction
- By no means was this the start of the aerospace industry
 - Start of how we view the industry today with space being just as important as any other aspect of our defense programs

- NASA grew out of necessity and not curiosity
 - 1958 started as just 8,000 employees
 - A decade later had over 35,000

NASA Civil Service Workforce Employment Trend



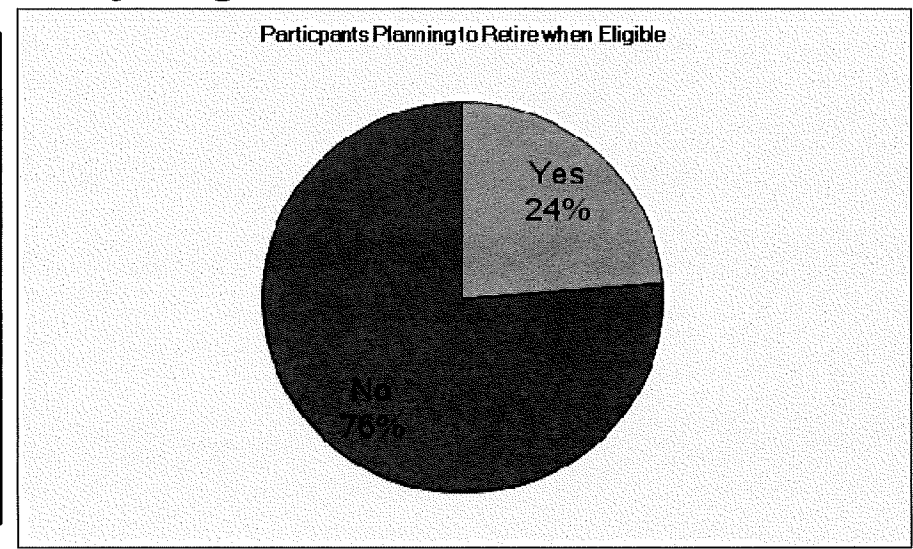
[The Ramifications]

- First set of baby-boomers became retirement eligible in 2008
 - Estimated that nearly 8,000 people become eligible every day in US
- Over 40% of workforce is currently over 55
- Over the next decade the number will grow to over 60% of the current aerospace workforce

[The changing economy]

- The economic downturn in 2008 has been a game changer
 - Retirement timetables are no longer a sure thing as people are delaying retirements

• Citing issues related to losses in their 401Ks and the increasing cost of universities for their children as main concerns for delayed retirements



Companies can no longer estimate their workforce from year to year accurately

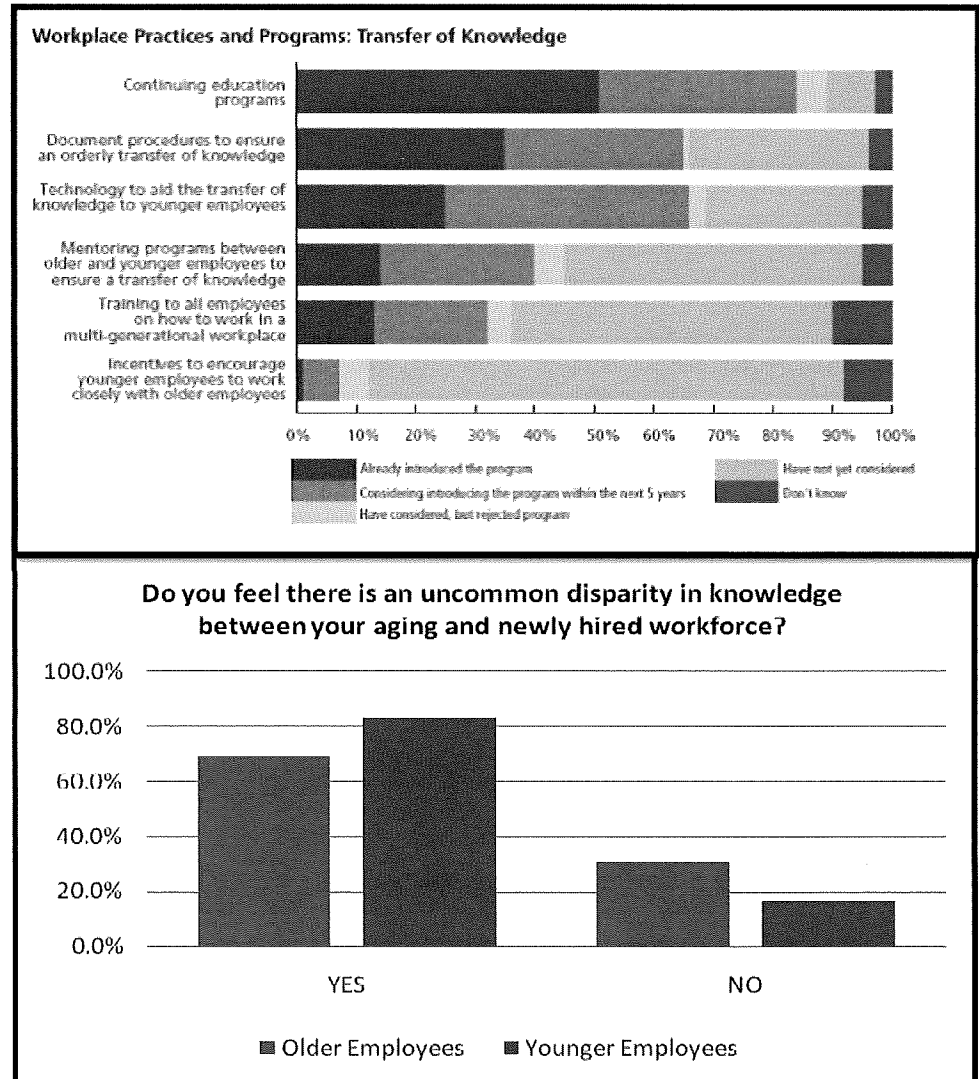
[Does it really matter?]

- 'My company is doing enough to transfer knowledge'
- 'It's not really that important to just re-learn information'
- **It's the little things that often times are the most important ones**
 - Mars Climate Orbiter – Loss of \$125 million satellite
 - Metric vs. English Units were the demise of the spacecraft
 - "Personnel were not trained sufficiently in areas such as the relationship between the operation of the mission and its detailed navigational characteristics, or the process of filing formal anomaly reports."
 - Personal experience where an employee retirement resulted in loss of a 'recipe' of how to properly mix adhesive components together
 - Impact of millions of dollars and many months lost to the company

Personal and historical examples makes it hard to deny the importance of retaining knowledge

Sentiment around the industry

- While companies might feel as though they are doing enough to transfer knowledge, employees obviously don't share the same sentiment

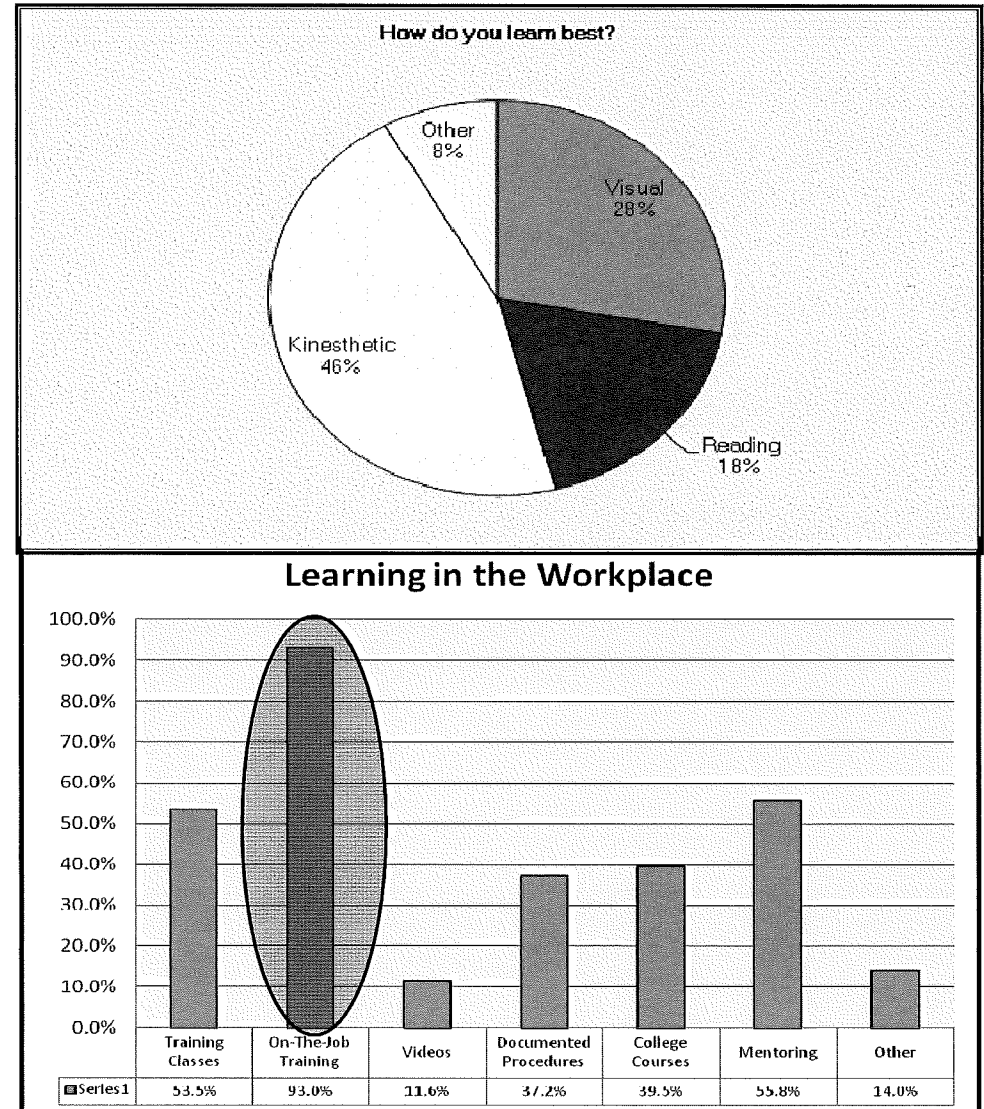


[Approach to solve the problem]

- Figure out how people learn best
- Utilize knowledge management best practices
- Leverage new technologies which push the boundary of human and computer interactions
- Verify and validate with target audience what learning techniques would most benefit them

How people learn in the industry

- OJT along with mentoring is by far the most widely used learning techniques
 - Reliance on precious commodity
 - Senior engineers time is limited and with retirements might become a scarce resource
- Employees not able to learn as effectively as possible without kinesthetic exercises like OJT



[Knowledge Management Best Practices]

- Need for a central repository of information
 - Multiple avenues create confusion about what knowledge is stored in each location
- Links between various types of information is essential
 - This includes links between people, processes, and systems
- Employee interaction needs to be a priority and a natural occurrence
 - Stove-piping only keeps knowledge from spreading as intended
- Mentorships are a necessary part of the equation
 - A well defined and operating mentorship is the best way to transfer knowledge
- Knowledge must be kept in various formats to accommodate the person as well as the information
 - There is no one size fits all for information

[What is KMInfoShare?]

- Purpose

- Facilitate the transfer of knowledge between the aging workforce to the younger incoming workforce of an industry or company

- An innovative software based tool

- Employs the expertise of knowledge management to perpetuate the efficient and effective transfer of knowledge
- Targets the needs of each individual company
- Targets the needs of each individual industry
- The next best thing to being able to transfer information into people through USB!

[Main Features]

- 1) A server system to store all data, video, and audio in.
- 2) The actual software program which would be the architecture and back-bone for how the actual system works (Graphical User Interface - GUI).
- 3) The website and search function that brings everything on the server together in a practical way and links all information together as well as brings individuals together with similar knowledge.
- 4) A video and audio capture system for training purposes
- 5) A system for recording written and audio notes
- 6) A robust speech-to-text encoder

- Central Repository
- Essential Linkages
- Employee Interaction
- Various Formats for knowledge
- Mentorships

Along with a solid mentorship program, KMInfoShare allows for the efficient transfer of knowledge

[Other Important Details]

- Complete document editing features
 - Allows multiple people in documents at the same time
- Search functions that mirror popular search engines like GOOGLE search
- Encyclopedic documentation with user edits like Wikipedia
- Employee interaction that mirrors social networking sites like Facebook

KMInfoshare allows for JIT (Just-in-Time) Information

[Key Technologies]

- Simple and Intuitive GUI that can be modified toward the company and industry needs
- Dragon NaturallySpeaking - Speech-To-Text encoding software
 - Allows for captured video and audio to be converted to a text based file that is fully searchable, linked and synced to the multimedia file
- Livescribe pen
 - Allows for audio capture during the note taking process
 - Audio is linked to the handwritten notes and synced up to the particular note for that audio recording
 - More in-depth note recollection than traditional pen and paper

[Security Concerns]

- Aerospace industry is restrictive
 - Companies need to mix different levels of security for commercial, government and classified programs
- Security was the biggest concern raised by survey takers
- KMInfoshare is used to share information across multiple business unit and organizations
 - It is not to compromise the integrity of the company's security protocol

[Security Mitigations]

- Login access restrictions
 - Ability to restrict access based on a number of different factors
 - Type of information or by individual documents
 - Business unit, organization, down to the individual
- Media encryption for any files that need to be tracked separately
- Active/Passive RFID tags on hardware such as pens
 - Allows for access to track hardware within the facility
 - If tracking is required outside of facility, GPS trackers could also be utilized as needed
 - While tracking is a concern it is not uncommon already in the industry
 - Only used when ethical issues are raised
- Combine active ID tags with electronics to automatically shut down any recording or playback devices outside facility

Security is customizable to the level that is needed.

[Business Model: The Methodology]

- Partnerships with the various technology players
 - Livescribe pen, DragonNaturally Speaking Software, etc.
- Complete marketing campaign to penetrate target audience of all aerospace professionals
 - Website and magazine advertisements
 - Conference and trade show displays
 - Company meetings and product demos to close the deal
 - Goal is to penetrate 1% of market in first operational year
- Charge companies for licensing costs as well as support costs
 - Use of site licenses vs. individual licenses depending on size of the company
- Establish a LLC (Limited Liability Company)
 - Limit risk exposure to lawsuits as well as stay flexible to future changes

Model is to get the product in front of the customer early and often

[Business Model: In the numbers]

- Funding needs are from product development and marketing campaign
 - ~ \$200K*
- All other funding is to be provided by owner and CEO
- Revenues from:
 - Licensing costs: \$1000-\$5000/employee*
 - Support/Maintenance costs: \$200/employee/year*
- Estimated savings/employee: 20 months of employee salary ~ \$200K*
- Estimated ROI is over 100% for each employee*

Anticipated profit reached before end of first year of service

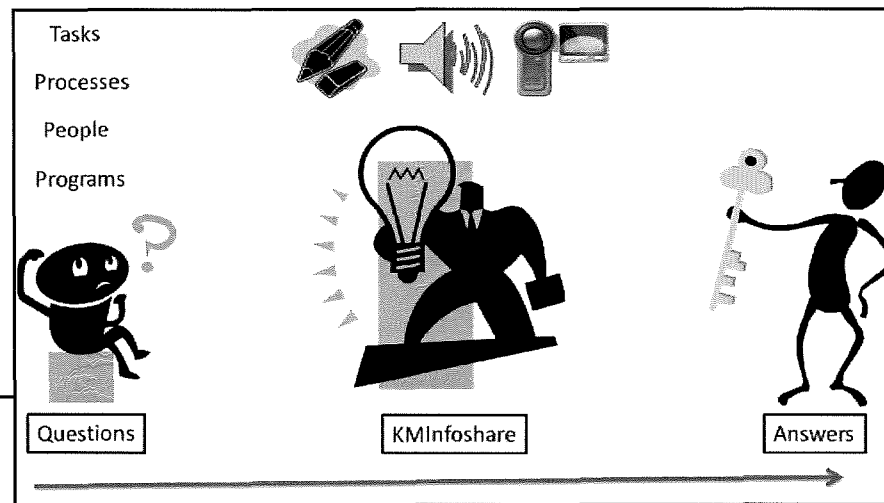
*For full details see thesis paper

[Implementation]

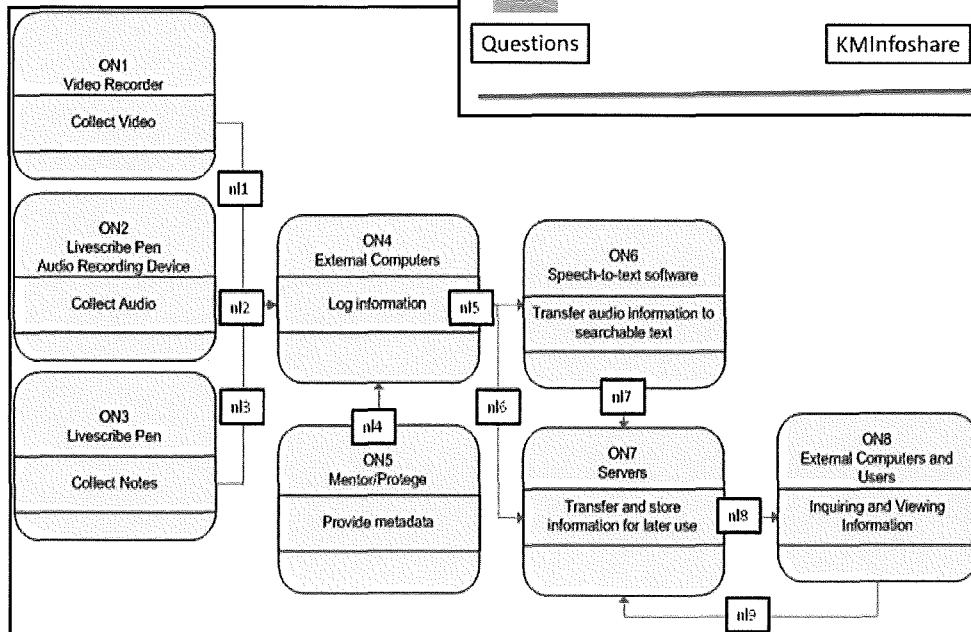
- Process for a new hire:
 - Two part in-depth training of processes and hardware through hands-on courses as well as videos as applicable
 - 2 weeks time
 - Mentorship shadowing
 - 4 weeks time
 - Rigorous detailed task plan with 'homework' developed and performed with periodic mentorship oversight
 - 2 weeks time
 - Assignment of work level tasks with minimal mentor oversight
 - 2 to 4 months times
- Most importantly – Need full management support!

Defined action plan leads to an effective engineer within four months after hiring

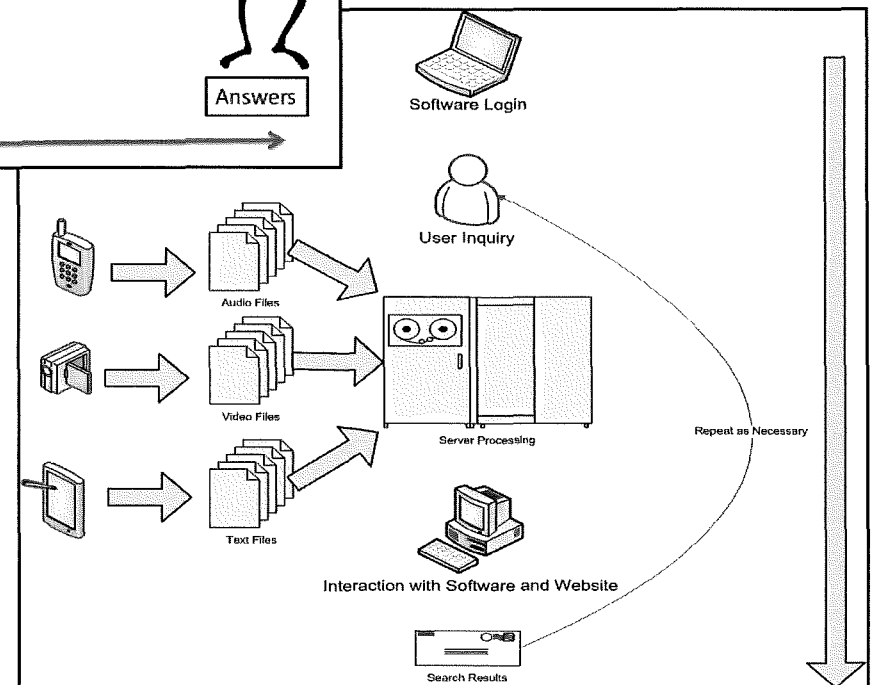
Systems Architecture: OV's



OV-1 High Level Operational Concept Graphic

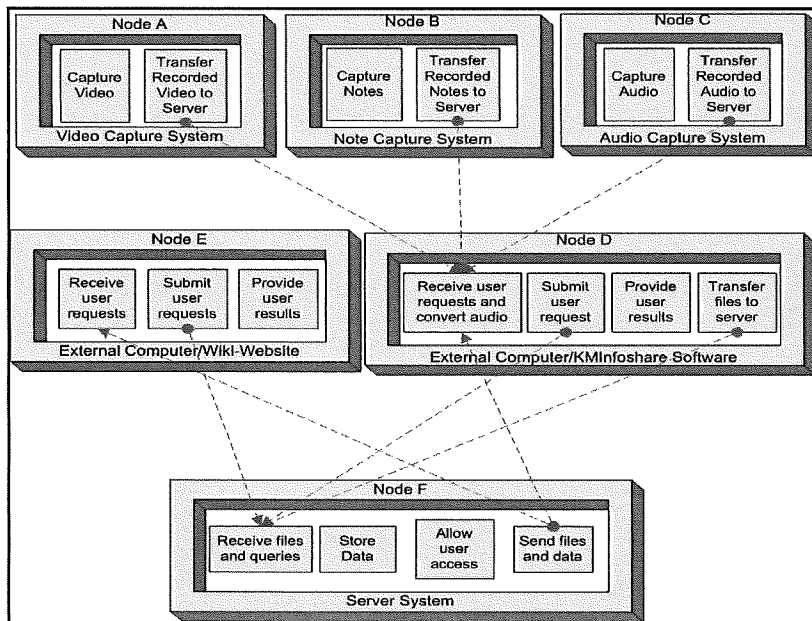


OV-2 Operational Node Connectivity Description



OV-5 Operational Activity Model

Systems Architecture: SVs



SV-1 Systems/Services Interface Description

SV-5	Operations	Collect Video	Collect Audio	Collect Notes	Post information to servers	Input meta-data to new files	Transfer information to searchable text	Viewing and Inquiries
Systems	Functions	Video Recorders	Audio Recorders, LiveScribe	LiveScribe	Computers, Servers	mentor/mentee	Speech-to-text software	Laptops and Desktop computers
Video Recording Device	Record Video	•						
	Post Videos	•			•			
Audio Recording Device	Record Audio		•					
	Post Audio		•		•			
Handwriting Recording Device	Record Notes			•				
	Post Notes			•	•			
External Computer/Wiki Website	Take user requests							•
	User Requests							•
	Provide Results							•
Server System	Store Data				•	•		
	Allow Access							•
	Send and Receive Data							•
External Computer/KMInfoshare Software	Take user requests				•	•		•
	User Requests				•			•
	Provide Results							•
	Transfer audio, video, and handwriting to text files						•	

SV-5 Operational Activity to Systems Function

[Demos]

- Website Demo
- Product Website Demo

[Summary]

- Aerospace industry is facing a tough challenge
- Time is still available to bridge the gap
- KMInfoshare offers a solution to the problem

[Questions?

]



Back-Up Slides

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[Advice for future students]

- Pick topic early!

[Other Benefits to the Software]

- Can be used to capture entire meetings without the need of taking minutes
 - Captures roster
 - Captures action items
 - Captures lessons learned and troubleshooting
 - Resolve conflicting stories
 - And many others!

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