# Conceptual Models of the Mission Space (CMMS)

DMSO

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# M&S Master Plan

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| Objective 1 | Objective 2 | Objective 3 | Objective 4 | Objective 5 | Objective 6 |
|---|---|---|---|---|---|
| Develop a common technical framework for M&S | Provide timely and authoritative representations of the natural environment | Provide authoritative representations of systems | Provide authoritative representations of human behavior | Establish a M&S infrastructure to meet developer and end-user needs | Share the benefits of M&S |

- M&S Master Plan Has six objectives
- Most important is the technical framework
  - High Level Architecture
  - CMMS
  - Data Standardization

# Diverse Developments within a Common Technical Framework

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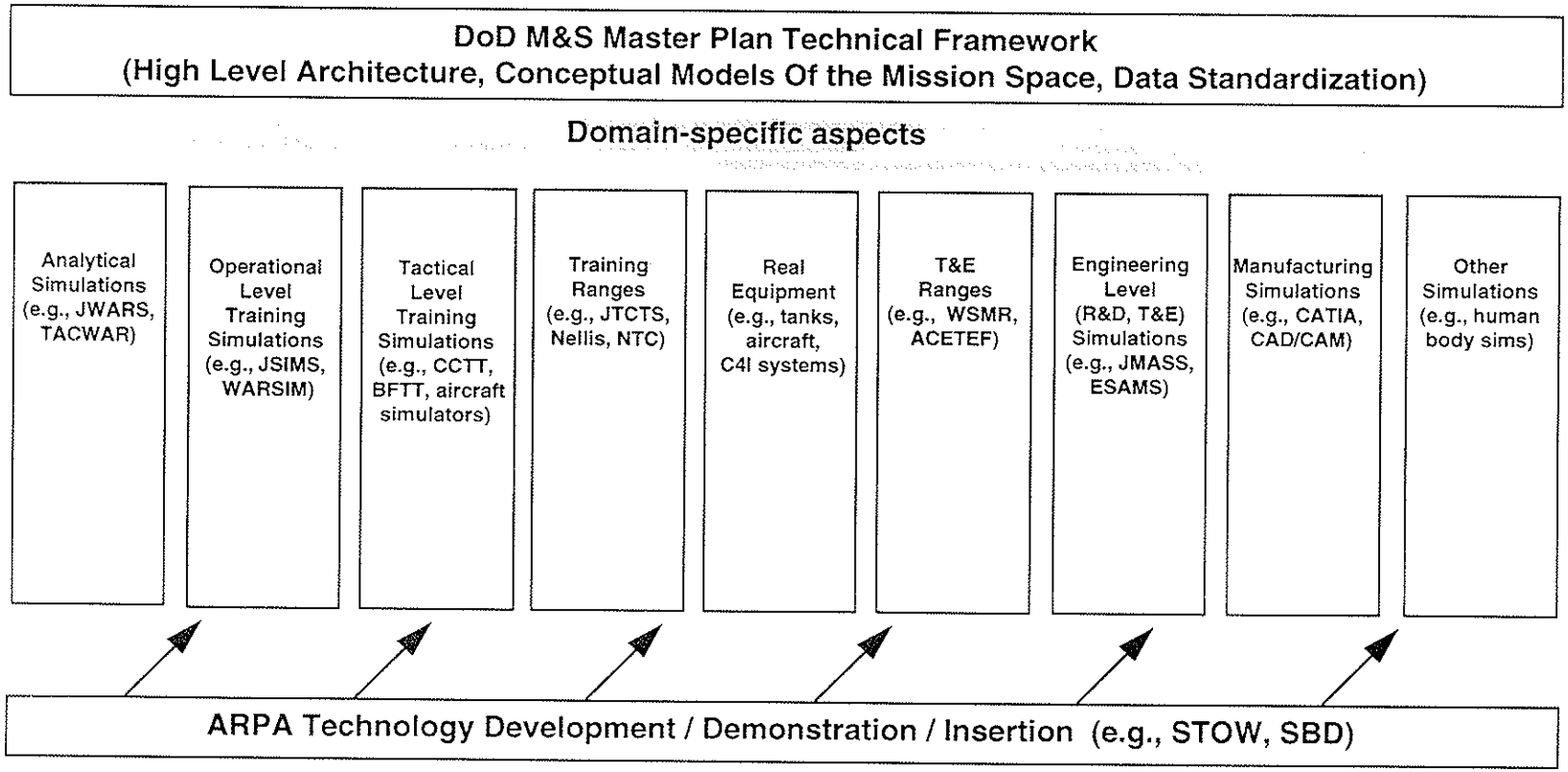

# Conceptual Models of the Mission Space

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## Simulation Development Process

| Real World | CMMS | Front End Analysis | Implementation |
|---|---|---|---|

Simulation Independent | Simulation Dependent

# What is a CMMS?

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- A clear picture of what designers must represent in order to produce a workable model or simulation for any purpose.
- A depiction of real DoD operating entities and their actions and interactions.
- Contained within a flexible framework for the integration of DoD operations knowledge; accessible by broad mission area, task or organization
- Maintained as a validated, relevant, authoritative abstraction of the real world

# CMMS Illustrative Example
## Interaction Selection Display

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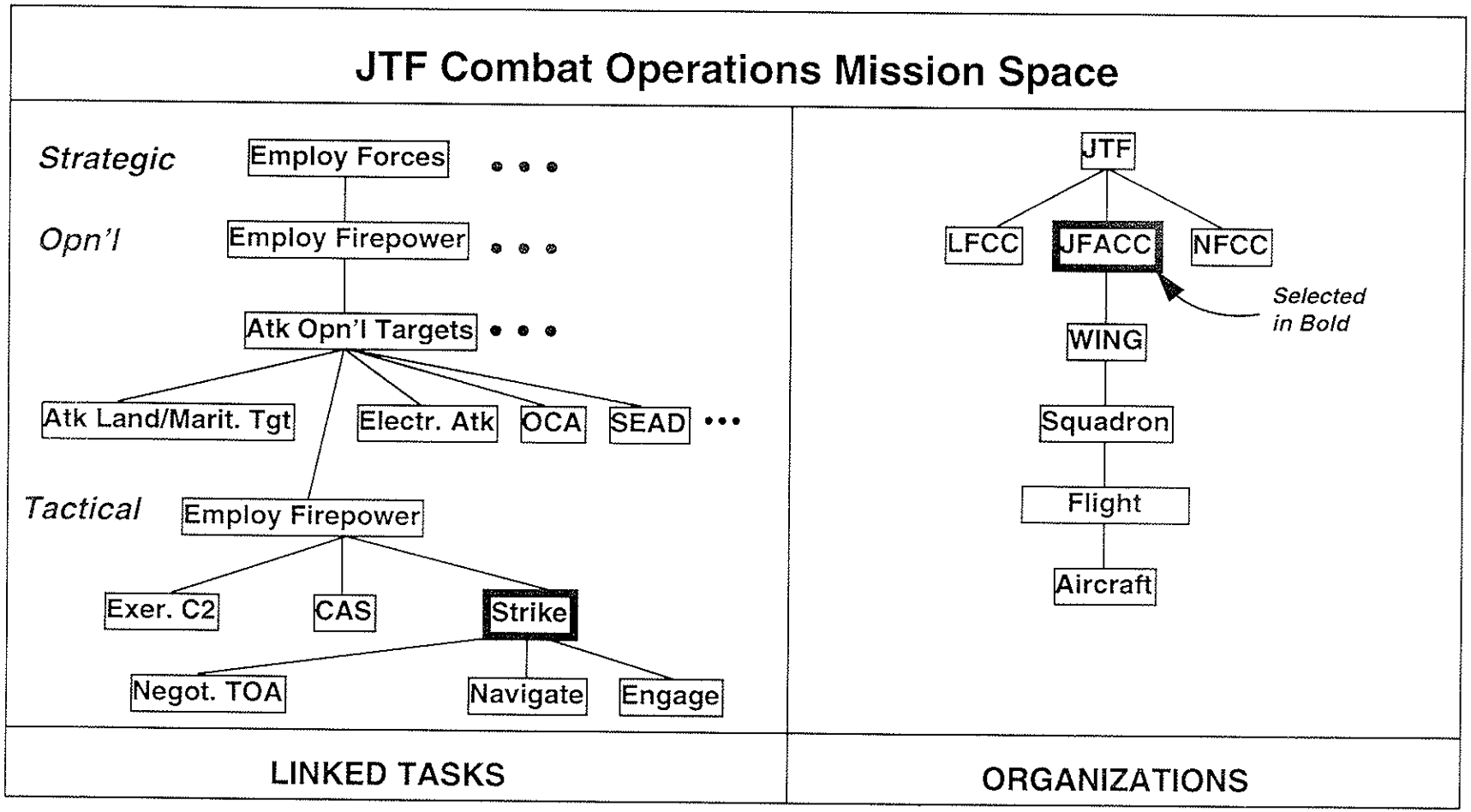


***User Selects Interactions Involved in the Strike Task by the JFACC ...***

# CMMS Illustrative Example
## Interaction Display

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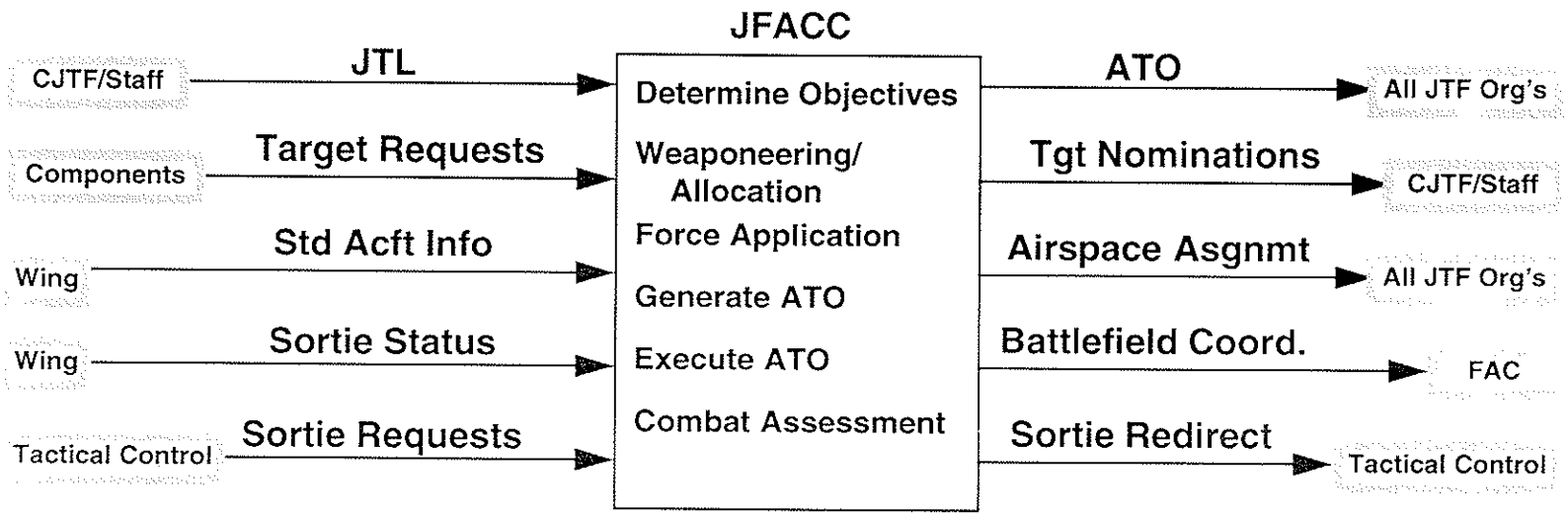
## JTF Combat Operations Mission Space




***... Display Shows All Actions and Interactions for the Selection, in the Mission Space***

# Universal Joint Task List (UJTL)

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- Negotiated with the CinC's and published by JCS
- Standardized tool for training requirements
- A menu of capabilities (mission-derived tasks) that may be selected by a joint force commander and may be assigned to integrated service components to accomplish the assigned mission
- Described within the framework of Strategic, Operational and Tactical Levels of War
- Component Interoperability and Service Tasks to be added

# Organizational Concept

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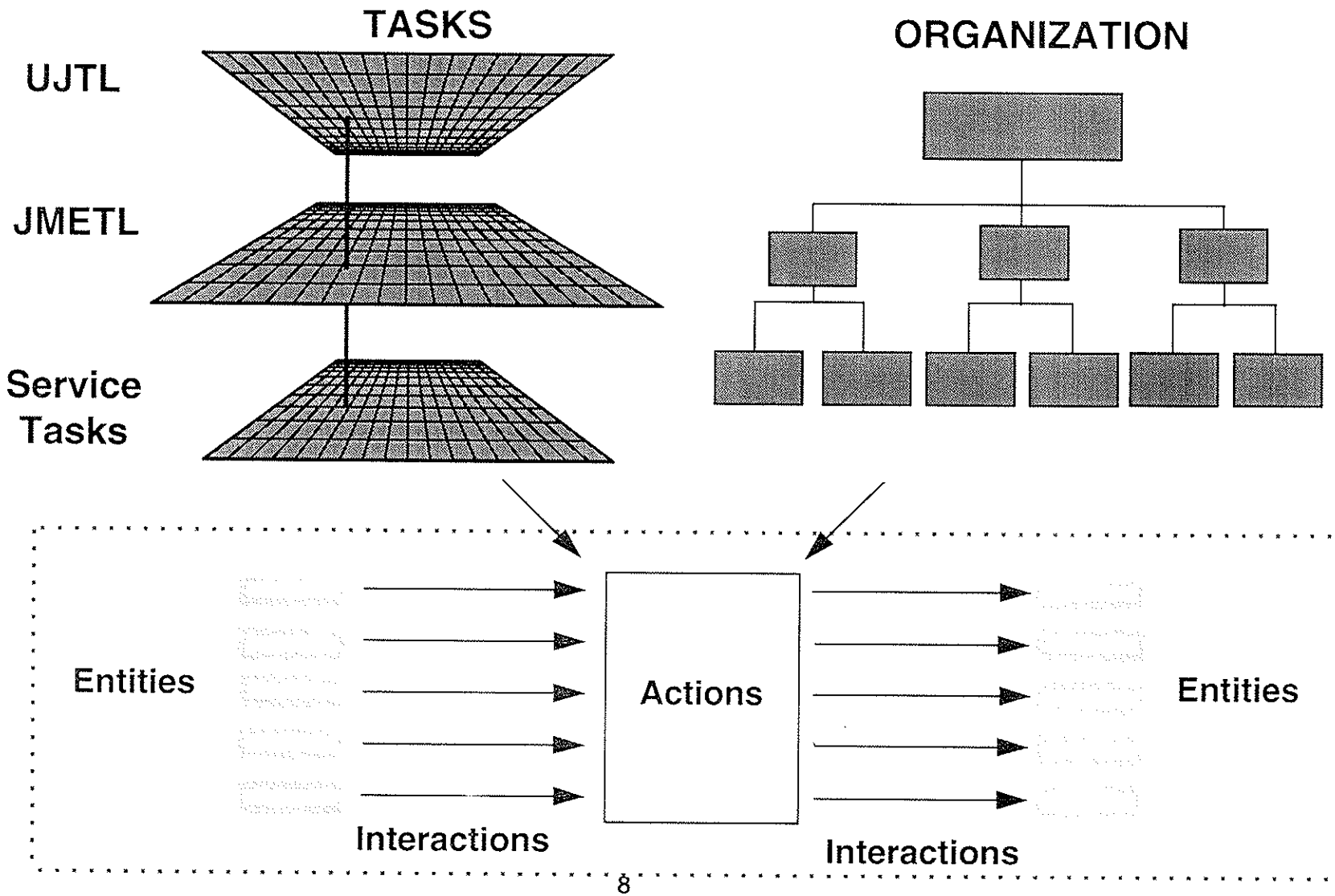

# CMMS Purpose/ Value Added

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- Facilitates knowledge acquisition activities of simulation developers, and captures their full benefit
- Bridging function among
  - warfighters
  - simulation developers
  - doctrine commands
  - training community
- Facilitates traceability to support VV&A
- Means to map M&S capabilities against real world
- Means to alert developers of need for updates
- Facilitates interoperability and reuse

# CMMS History

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- June Workshop at STRICOM with major M&S stakeholders
  - CMMS
    - Is simulation independent
    - Models entities, actions and interactions
    - Stores variable detail level depending on need
  - FDB and other repositories provide algorithms, sample data and code
- O-6 Level CMMS Management Group
  - JSIMS, JWARS/JAMIP, J-7, JWFC, STOW and Service Domain Analysis representatives
  - Planned quarterly meetings beginning last August
- Technical Working Group
  - KA (Knowledge Acquisition) Technical Director level; JWARS/JSIMS, STOW, WARSIM, AF Domain Analysis, BFTT/NSS, J7, JWFC
  - Met August, October and December; next meeting mid-February
  - Cross-community technical coordination & CMMS technical guidance

# CMMS Strategy

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- Today's simulations
  - No common technical framework
  - Different knowledge acquisitions for the same information
  - Knowledge acquisitions not authoritatively archived
- DMSO Master Plan
  - Advocates common technical framework - HLA/CMMS/Data Std
- Future M&S Programs
  - Common approach to simulating the real world
    - Authoritative source list
    - Technical framework with specific conditions and standards
    - Tools with hooks to simulation development
  - Coherently coordinated methods
  - Leverage each other's efforts
  - Increased interoperability and reuse of development efforts

# Technical Working Group

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- Objectives
  - Provide feedback to DMSO on CMMS implementation efforts from knowledgeable developers
  - Develop minimum required semantic and syntax standards to facilitate the integration of knowledge acquisition results
- Service-level technical representation in the future
- Resulted in joint knowledge acquisition by JSIMS and JWARS and other cross-project coordination
- Common Knowledge Acquisition spinoff- group
  - JSIMS/JWARS, FDB, AF Domain Analysis
  - Has met twice, discussing methods, database formats and common semantics

# Technical Framework

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- Major Component technical specifications
  - Detailed description of candidate Database component provided to experimenters, to be revised for prototypers
  - Strawman GUI's in the current draft functional requirements brief; experiments describing others for the GUI Component
  - Strawman management process ready for integration into Management Processes/Tools component
  - Experiments describing knowledge import, translation and integration tools for Knowledge Conversion and Management Processes/Tools components
- Operational Concept/Operational Requirements to be written in January
- Data Standardization specifying functional requirements for a Data Dictionary System to support CMMS
- CMMS placed in HLA Federation Execution Development Diagram

# CMMS PROCESS

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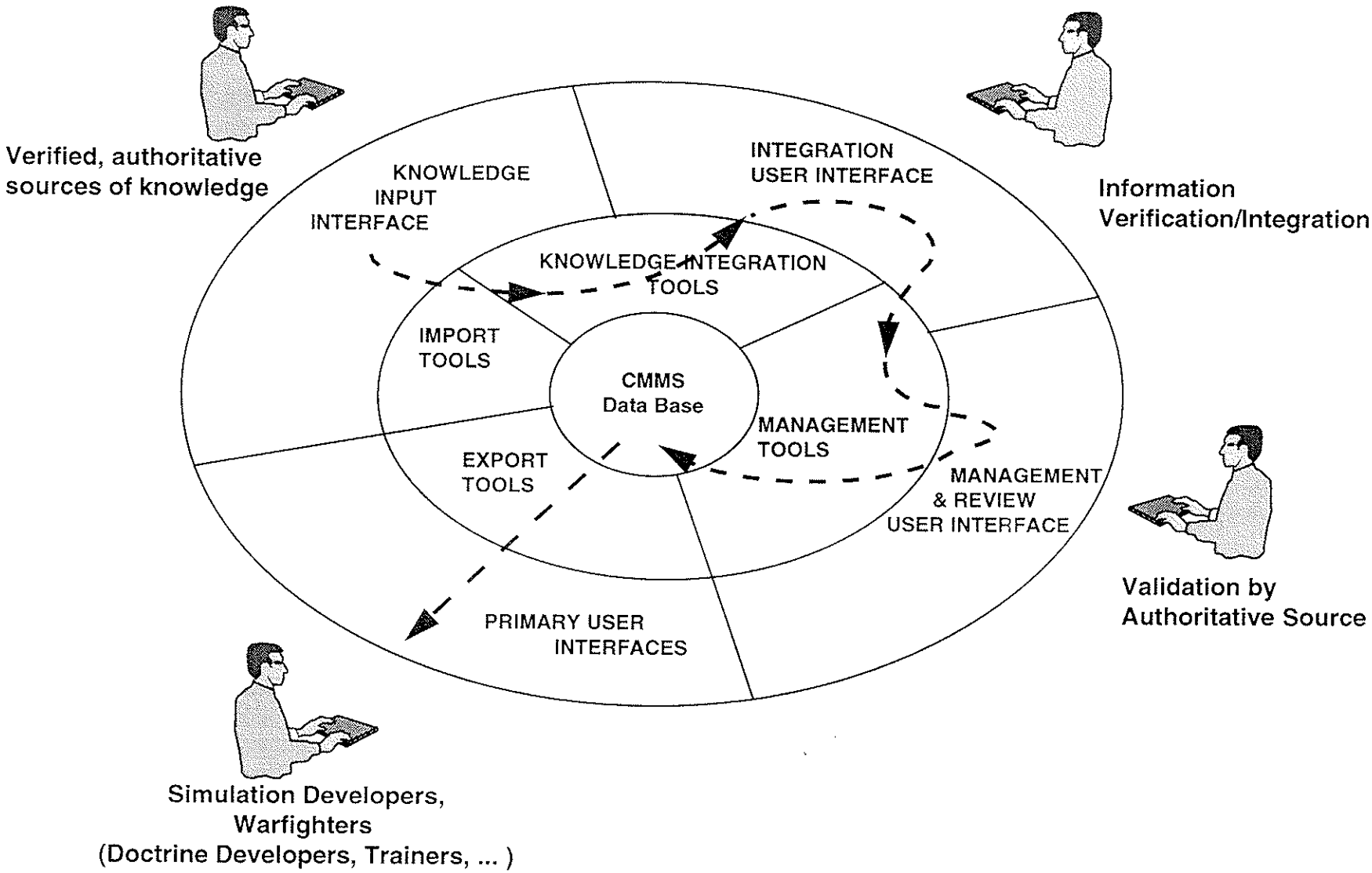

# CMMS Process Objectives

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- Identify authoritative sources of information
- Integrate information from independent knowledge acquisition sources
- Develop & maintain management processes
  - Plan for validation of real-world knowledge
  - Coordinated presentation of knowledge
- Establish a broadly applicable set of CMMS resources and tools

# General Requirements

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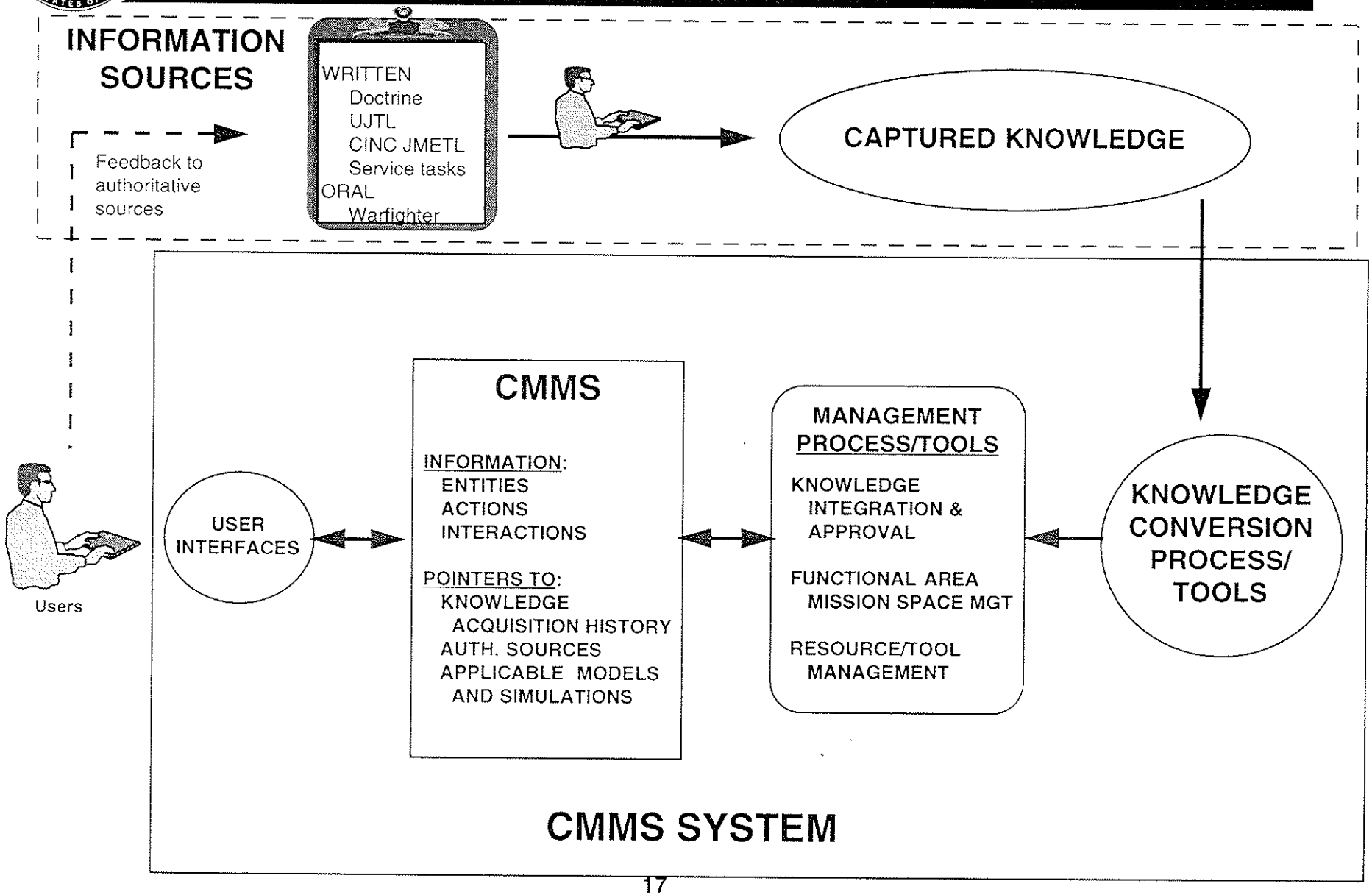
- Provides GUI's for all users
- Applies across the broad scope of DoD activities.
- Supports translation from multiple Knowledge Acquisition approaches.
- Allows models to use information already in CMMS System.
- Adjusts when schema changes.

# CMMS Process

DMSO



# CMMS Process

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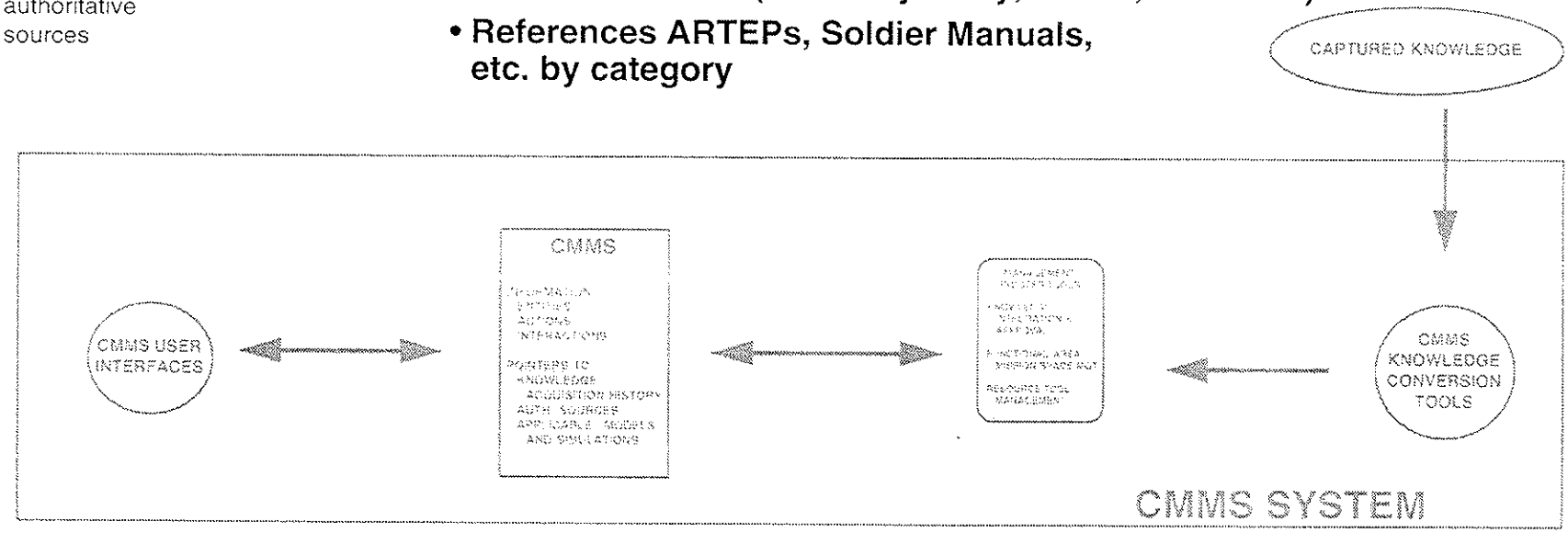
## Information Sources

WRITTEN
- Doctrine
- UJTL
- CINC JMETL
- Service tasks

ORAL
- Warfighter

Feedback to authoritative sources

- Support common knowledge acquisition authoritative sources
- List of Authoritative Sources
  - DMSO's draft is presently 90 pages, not exhaustive
    - No./Title, Source, Abstract
  - Sources
    - Joint Doctrine Pubs
    - Service Doctrine (Currently Army, USMC, Air Force)
    - References ARTEPs, Soldier Manuals, etc. by category



# CMMS Process

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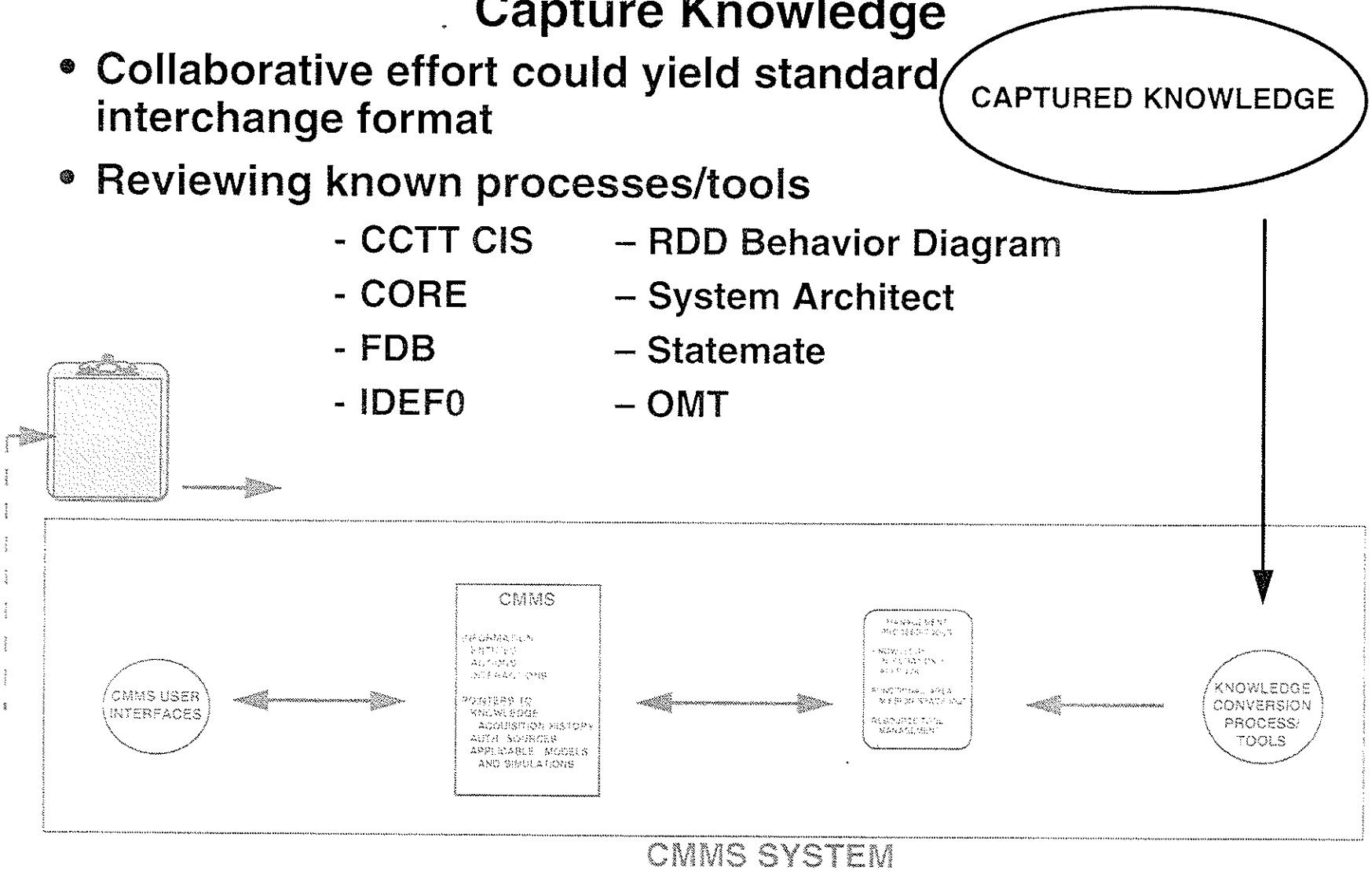
## Capture Knowledge

- Collaborative effort could yield standard interchange format
- Reviewing known processes/tools

| | |
|---|---|
| - CCTT CIS | – RDD Behavior Diagram |
| - CORE | – System Architect |
| - FDB | – Statemate |
| - IDEF0 | – OMT |



# CMMS Technical Framework

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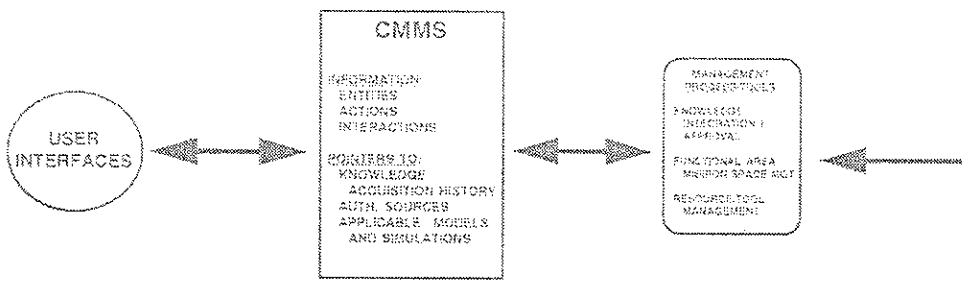
## Knowledge Conversion




CMMS SYSTEM

### KNOWLEDGE CONVERSION PROCESS/TOOLS

- Check source
- Import knowledge
- Check format
- Check content
- Direct deficiency correction and tool guidance information to knowledge acquisition analyst
- Convert knowledge to database format
- Integrate knowledge
- Convert and export knowledge

# CMMS Technical Framework

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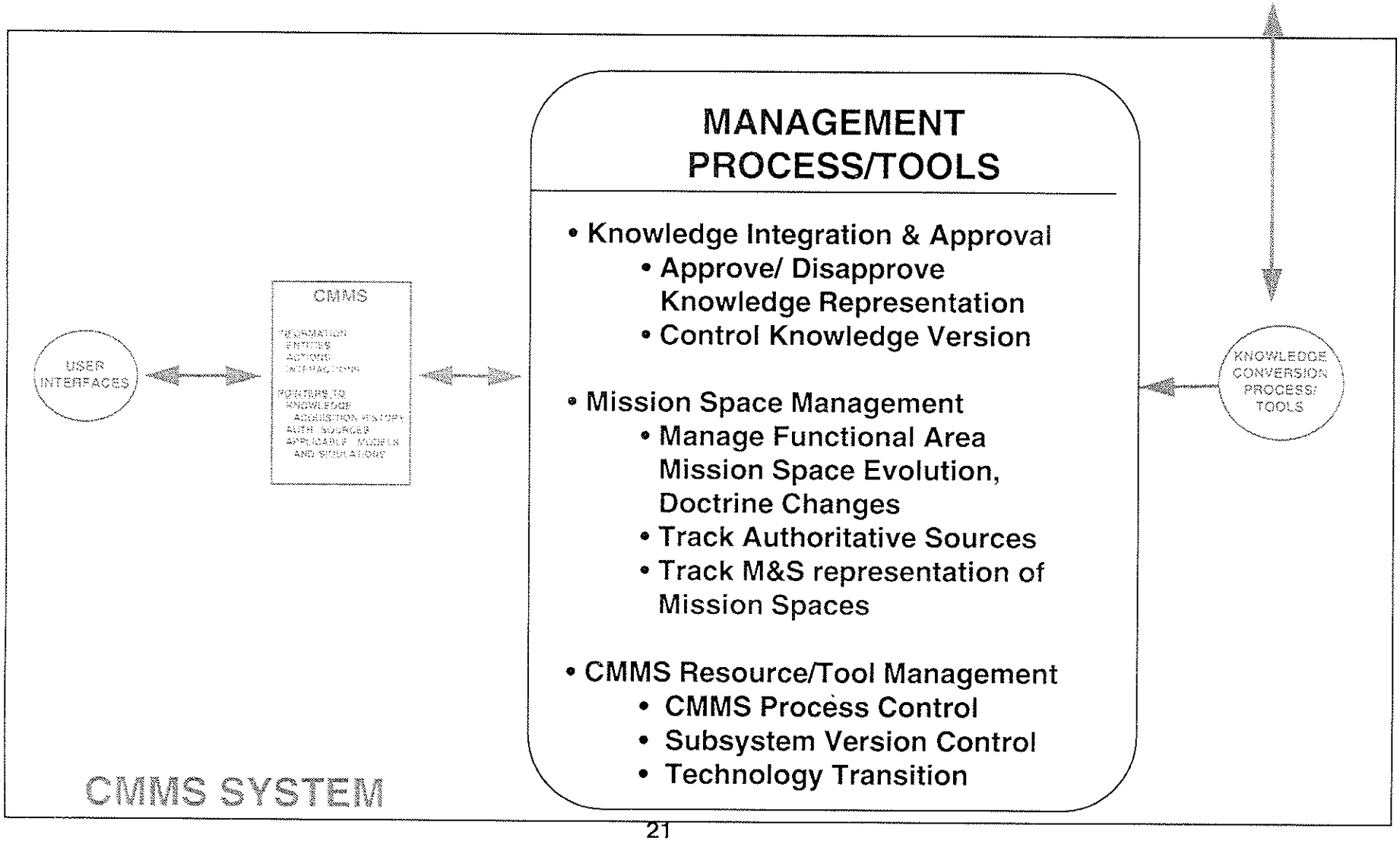
## Management Support Functions



# CMMS Technical Framework

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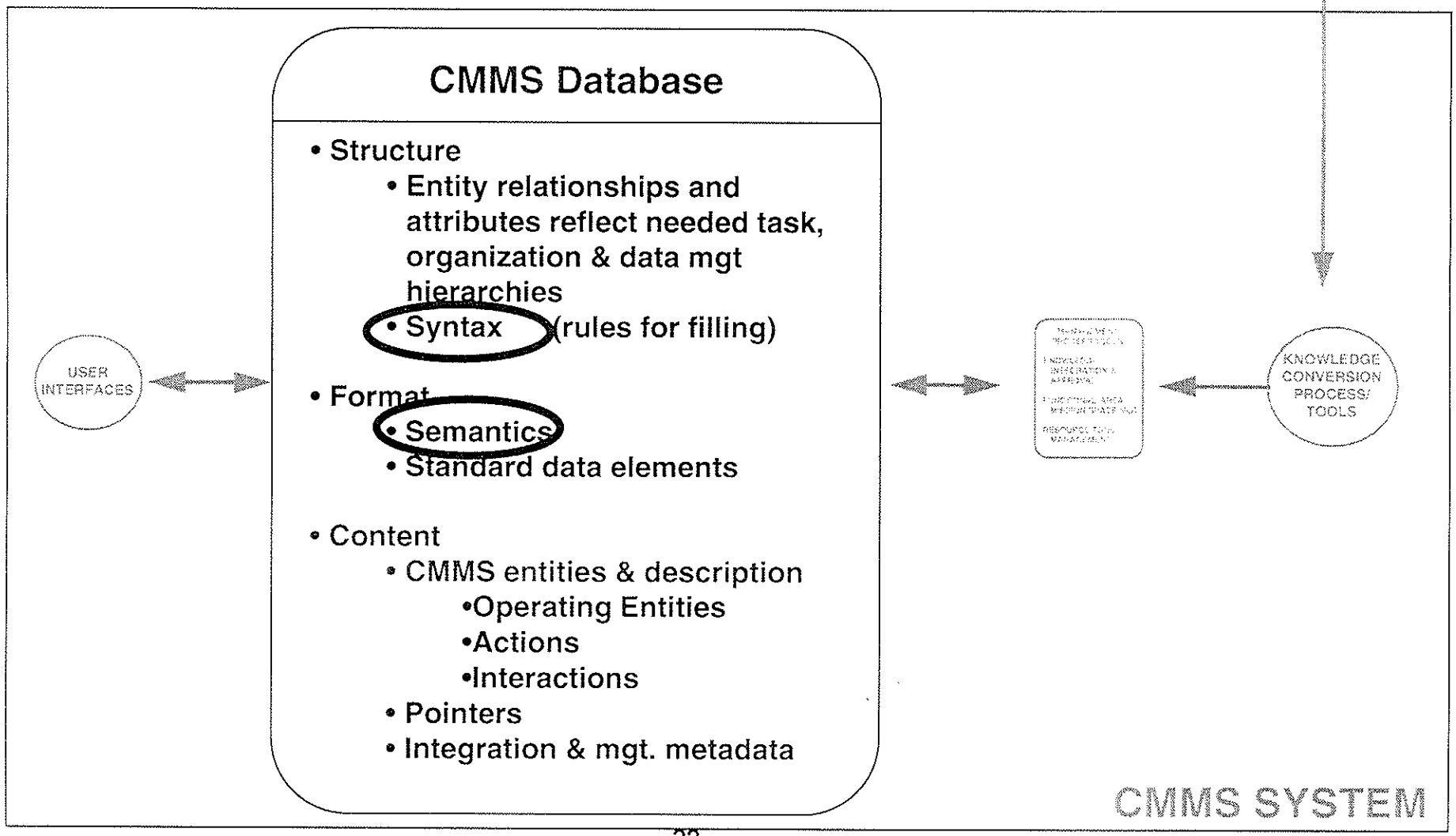
**Characteristics of CMMS are driven by the user interface, knowledge conversion and integration, and management functions.**



# CMMS Technical Framework

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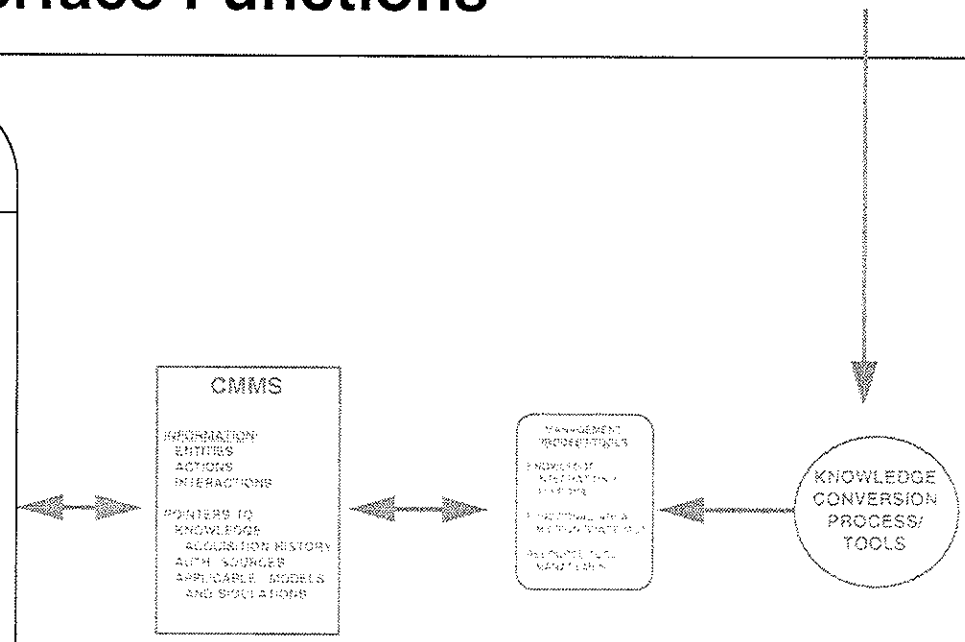
## User Interface Functions

### CMMS USER INTERFACE

- User-requested information
  - DoD entities and actions
  - Entity Interactions
  - Source
- Multiple user-requested views
  - Organization structure
  - Task structure
  - Model of interactions
  - Ability to visualize combat process
- User performance demands
  - Query response time
  - Graphic refresh time
- User-friendly




CMMS SYSTEM

# CMMS Experiment Phase

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- Further define CMMS concept
- Highlight and investigate relevant technical issues
- Provide insight into types of tools available and needed
  - DRC focus
    - User interface and tools for bringing unstructured knowledge into CMMS
    - UJTL expression in CMMS
    - Temporal view of operations and tasks through Operation Templates
  - SAIC focus
    - Tools for bringing partially structured knowledge into CMMS
    - WWW application to CMMS
  - S3I focus
    - Tools for bringing highly structured knowledge into CMMS
    - Database design and configuration management process
    - Primary user GUI

# Concrete Results of CMMS Efforts

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- JSIMS and JWARS have agreed to work together in knowledge acquisition and domain analysis
- Leveraging of efforts among programs
- CMMS experiments will provide simulation developers useful ideas - saving time and money