

TENIX DEFENCE



Tenix™

A fleet (or asset) lifecycle knowledge management architecture

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Some background on Tenix

- ◆ **Tenix Group ~ \$A 1 BN turnover and 3,000 staff**
 - **Largest Australian Defence Contractor**
 - **Divisions**
 - **Naval and commercial ships (e.g., Tenix ANZAC Ship Project)**
 - **Armoured vehicles, aerospace and electronic systems**
 - **Infrastructure & support**
 - **Products**
 - **Ships**
 - **Armoured vehicles**
 - **Electronics**
 - **Fleet related activities & services**
 - **Project management**
 - **Aerospace systems integration**
 - **Documentation and training**
 - **Logistic & base support**



ANZAC Ship Project



- ◆ **10 frigates (8 RAN, 2 RNZN)**
 - Total package
 - 15 year design/build cycle
 - 27 year designed lifespan for each ship
 - Computerised maintenance management
- ◆ **\$A 6 BN fixed price contract! (the one *not* in trouble)**

#5 commissioned 31 March 2001



M113 Upgrade Project



- ◆ ~ 350 Vehicles
 - 22+ variants (6 major types)
 - Long life-span
- ◆ Progressive upgrade
 - New systems
 - New documentation

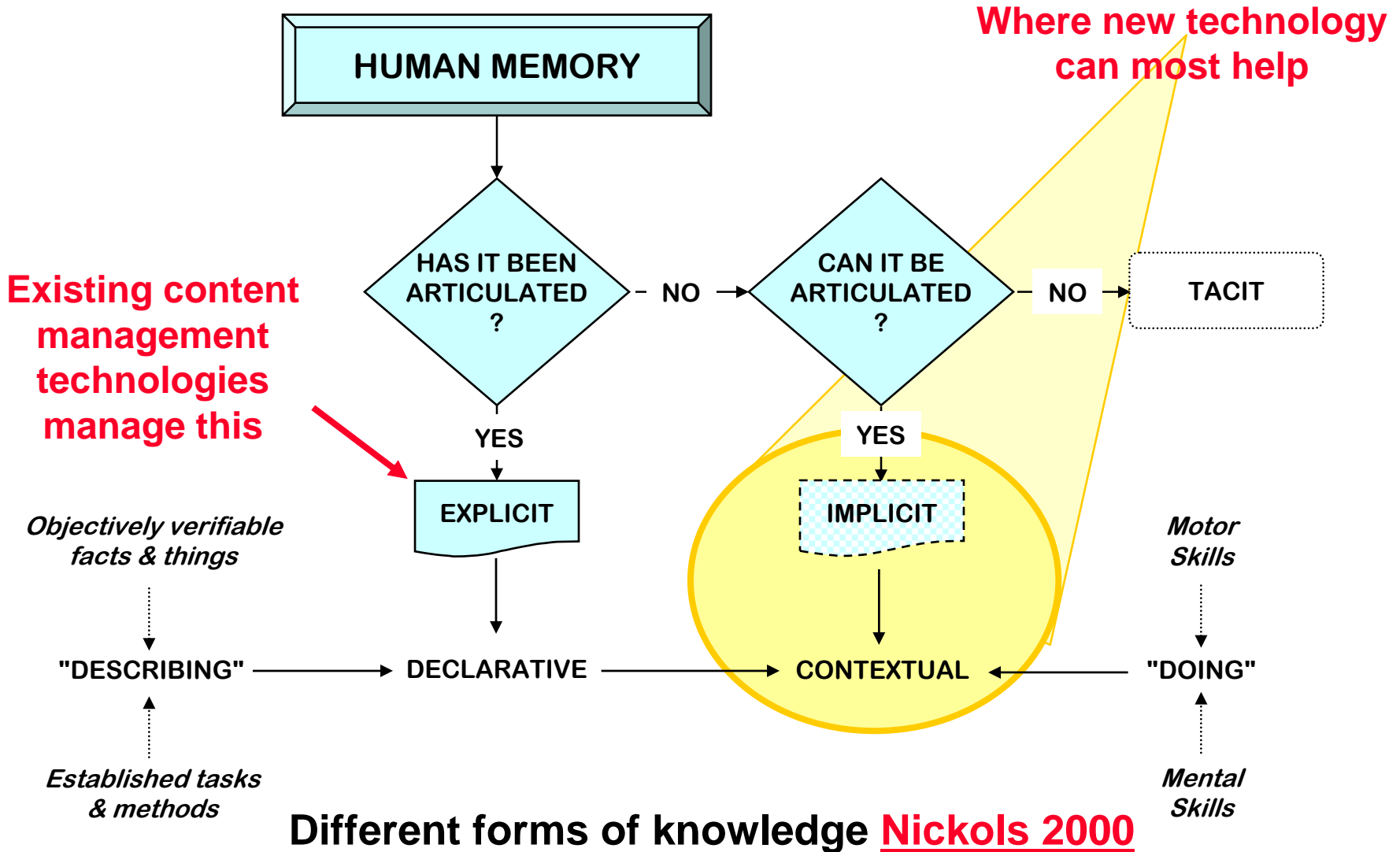


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**The Big Picture: Managing
fleet technical knowledge over
the project lifecycle**



Tacit and explicit knowledge in organisational contexts





Major issues for a fleet operator

- ◆ **Capability when it is needed**
 - **Reliably** does what it is supposed to
 - **Available** for service when needed
 - **Maintainable** - problems can be fixed when they arise
 - **Supportable** - critical needs available in supply chain
 - **Operable** within limits of human knowledge & capacity
- ◆ **Health, safety and operational knowledge issues**
 - Avoid Westralia, Longford, etc.
- ◆ **Life-cycle cost**
 - Minimise acquisition cost
 - Minimise documentation, support & maintenance costs

Adequate performance on all issues depends on effective authoring, management and transfer of technical knowledge from supplier to operators



Major knowledge delivery issues

- ◆ **Operational knowledge delivery goals**
 - **Correct**
 - Correct information
 - Consistent across the fleet
 - **Applicable/Effective**
 - Applicable to the configuration of the individual ship/vehicle
 - Effective for the point in time re engineering changes, etc.
 - **Available**
 - To who needs it, when and where it is needed
 - **Useable**
 - Readily understandable by humans
 - Readily managed & processed in computer systems
- ◆ **Knowledge production and usage goals**
 - **Fast**
 - **High quality**
 - **Low cost**






Tenix™

What Tenix is doing



Seeking innovative solutions engineering & support knowledge mgmt over the full lifecycle

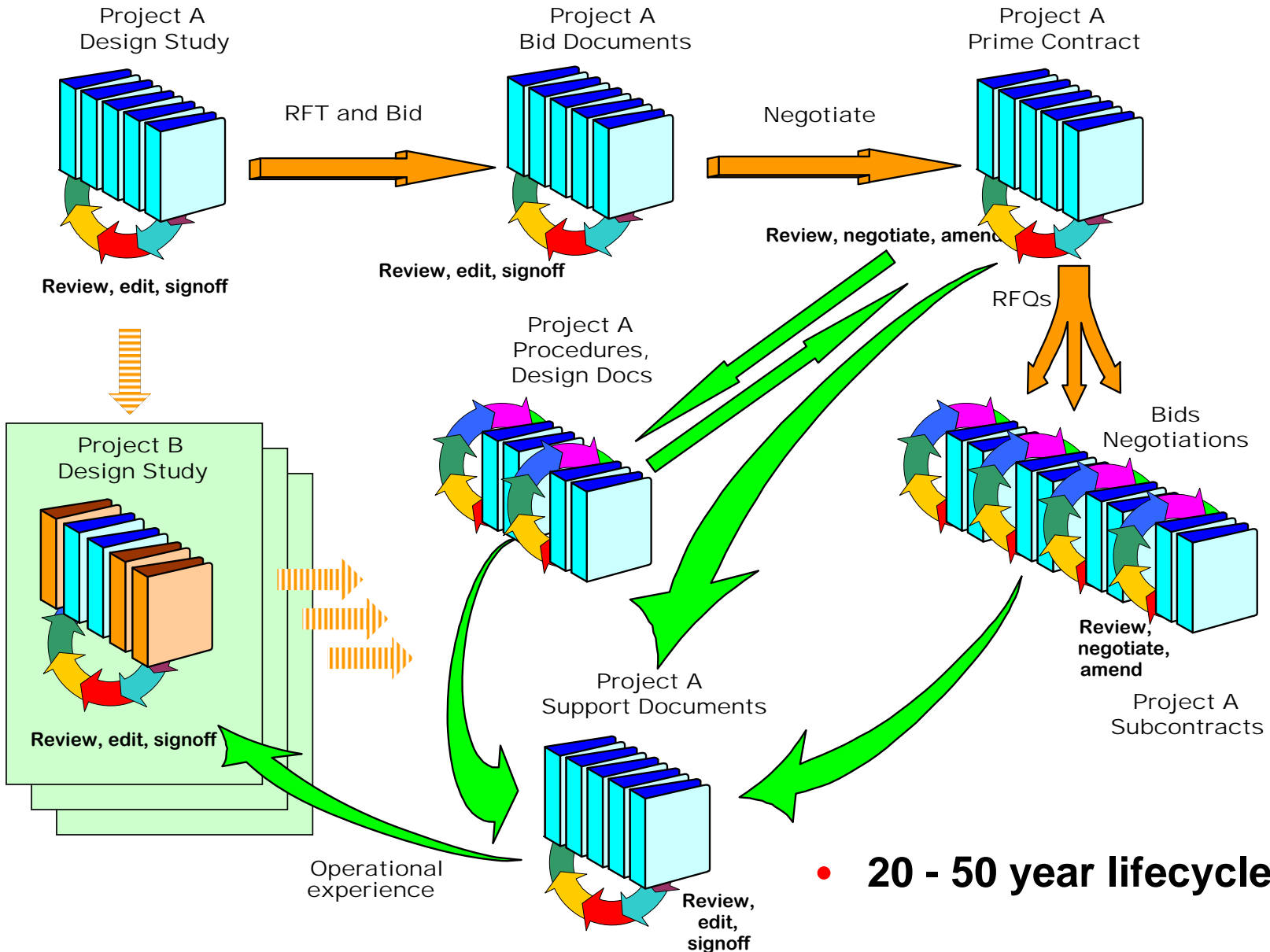
- ◆ **Committed to implement state of the art technical data management including IP development**
 -  **Interactive Link / DataGate for secure computing**
 - **Telelogic's DOORS requirements management**
 - **SpeedLegal's SmartPrecedent content authoring system**
 - **Structured authoring and content management solutions**
 - **“Spider” project to demonstrate STEP standards**
 -  **Data warehouse/Crossbow solution for configuration management issues**
 - **Electronic delivery to end-users**
 -  **CSARS in-service availability and cost analysis**
 - **Major R&D implementation/R&D capabilities with our associates**



= IP being commercialised



Simplified doco cycle for a large project



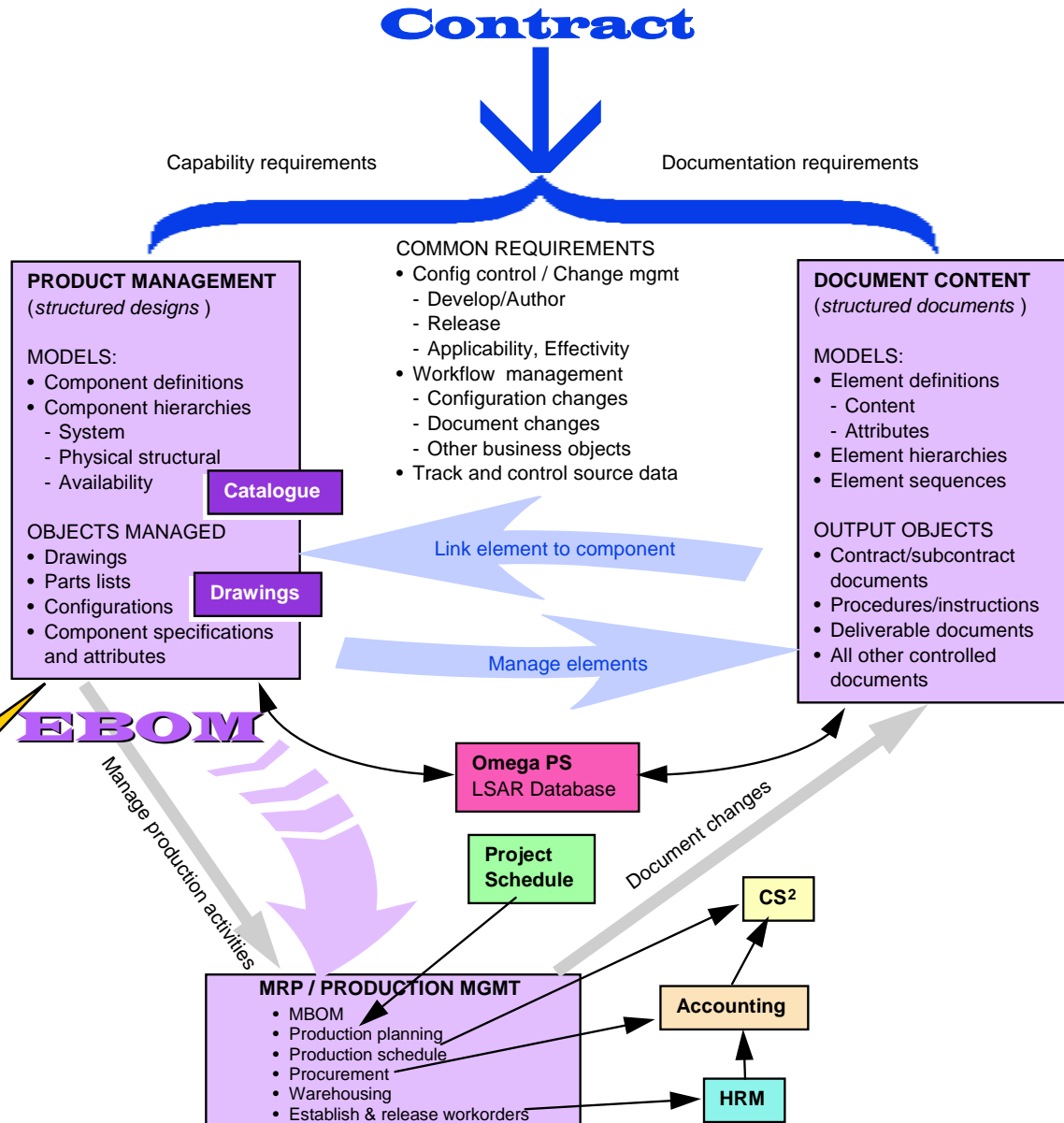


A CM/PDM “umbrella” integrates the pieces

- ◆ **Product data and documents are structured and managed as content**
- ◆ **Production data is transactional and is managed as records and fields**

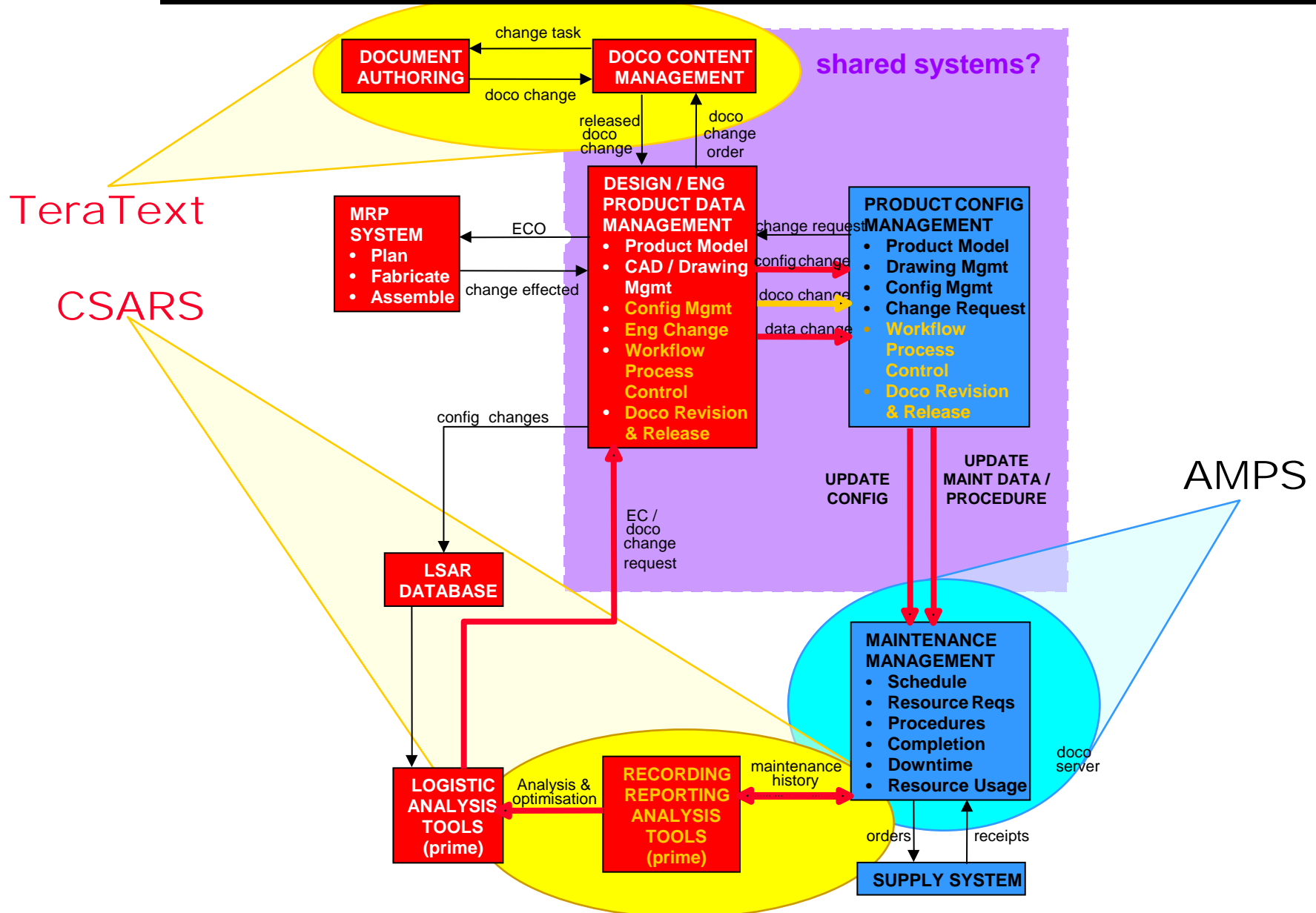
See [eMatrix](#), [Windchill](#), [TeamCenter](#)

ENGINEERING CHANGE





Case in point: Providing better knowledge management for ANZAC Ship in service support





TeraText (SIM) document & content mgmt

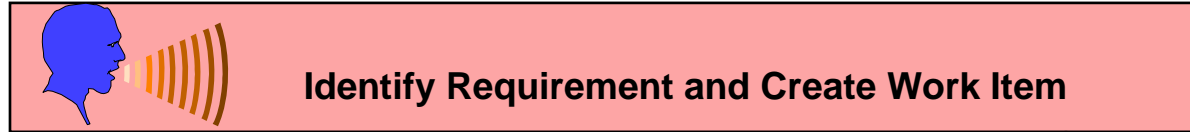


- ◆ **State of the art content mgmt system**
 - Native XML database optimised for scalability
 - Repositories for structured/unstructured docs
 - Concurrent indexing and retrieval
 - Application development tools (Ace or Java)
 - work flow
 - validation
 - extract
 - rendering (e.g., SGML to ASPMIS CDF / HTML / etc.)
 - delivery (Web and other formats)
- ◆ **100% Australian (RMIT/Aspect) IP**
- ◆ **100% sales & support in NA and Europe**

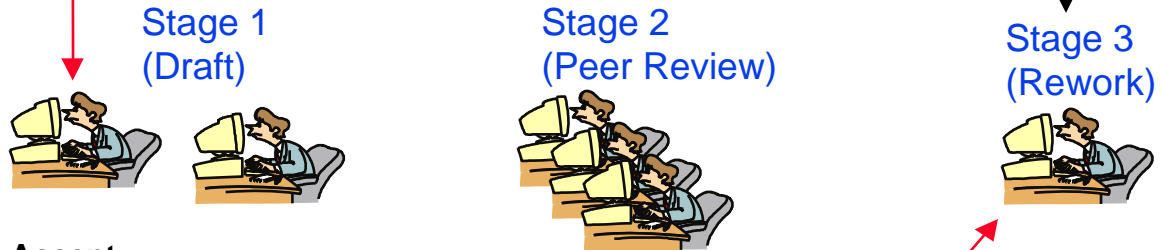


TeraText's role based workflow for ANZAC Ship maintenance procedures

Supervisor



Authors



Accept
Check Out

- modify metadata
line items
CMCs
triggers
- update
- open in FrameMaker+SGML;
- **register/link source documents**

Check In

- modify metadata
 - complete check in
- Author Release for Peer Review**

View
Annotate
Sign-Off as Reviewed

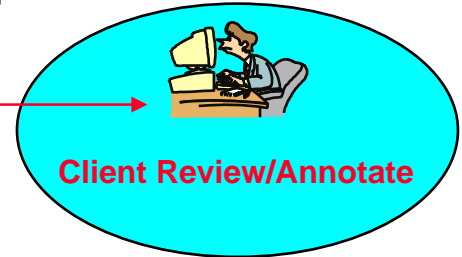
Supervisor Sets Peer Review Completion

Accept
Check Out
Check In
Release for QA Review

Stage 4 (Client Review)



Circulate for Client Review



QA/Supervisor

Release for Delivery



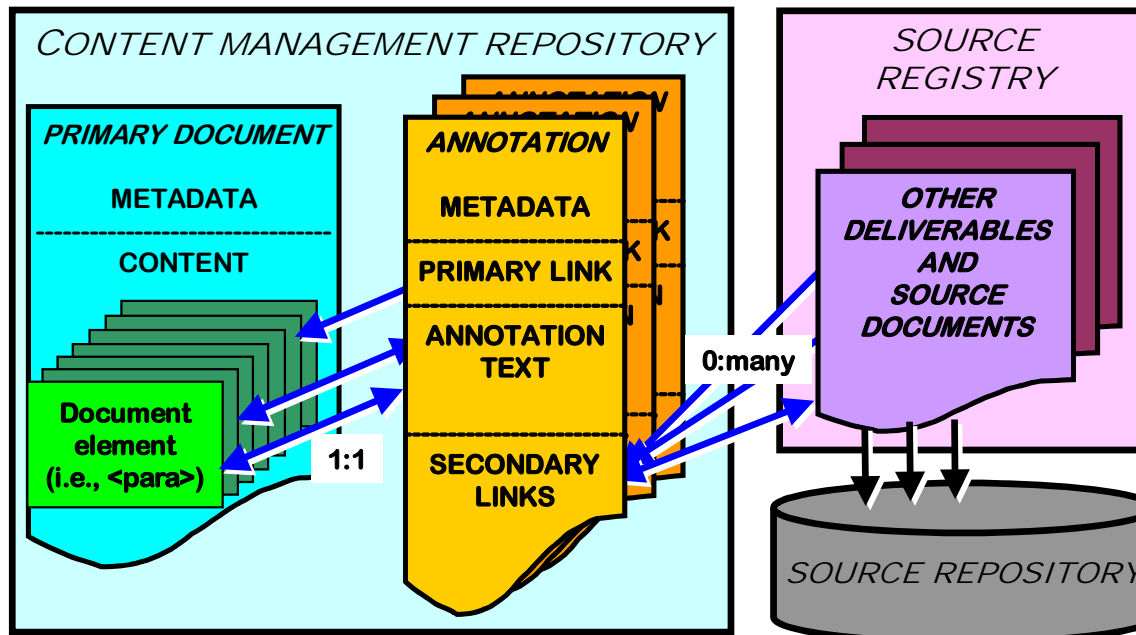
Tenix's ANZAC measured improvements from structured authoring and content management

- ◆ **Tenix's Ship 05 delivery challenge**
 - Client difficulties feeding flat files into AMPS
 - Documentation configuration management issues
 - ASP PA threat to not accept 05 if still dissatisfied
- ◆ **TeraText saved our bacon**
 - **Condensed 8,000 procedures for 4 ships to 2,000 class-set of 'SGML records' for 10 ships**
 - 5 people completely reworked 2,000 routines in around 3,000 person/hours - major quality gain
 - **Routines delivered for Ship 5 CUT 80%**
 - **Subsequent content deliveries CUT 95%**
 - **Keyboard time for one change CUT more than 50%**
 - **Change cycle time CUT from 1 year to days**
- ◆ **Client is now our best reference**



Later extension: Capture contextual knowledge with links and annotations

- ◆ Explicit and implicit links encode contextual knowledge
- ◆ Links are 2-way connections
- ◆ Annotations are the key to converting implicit contextual knowledge to codified explicit knowledge





Annotations

◆ Annotations provide the key to capturing context

Author Annotation view - Microsoft Internet Explorer

Author Annotation view

Author |
 External Review |
 Internal Review

MRC: CLASS-410-09-O-M-0-1--A0000132-9()

Paragraph: 62c7ffd0-acc4-11d5-81fe-00508b04acd2

Time: Thu Sep 20 10:19:57 2001

Author: Supervisor (super)

Date: Thu Sep 20 10:19:56 2001 Doc Version: 9.1

This is the source reference used for this paragraph.

Reference Publications		
Publication Number	Title	Ver
ABR 6187	Fan Group Switchboards for ANZAC Ships	0

Source registry reference

d. Move the desk to the full down position.

c. Inspect the gas strut fitted to each sic serviceable circlip. Ensure that the oper post and secured with a serviceable circlip.

d. 62c7ffd0-acc4-11d5-81fe-00508b04acd2 Raise and there is no abnormal noise or feel.

e. Lock the desk in normal position. App accordance with the procedure in APD.

Annotation may be added here

Yellow marker indicates annotation exists here. Click on marker to see it

http://a992941:6062/maintainRecords/refLinkWin/204 - Microso...

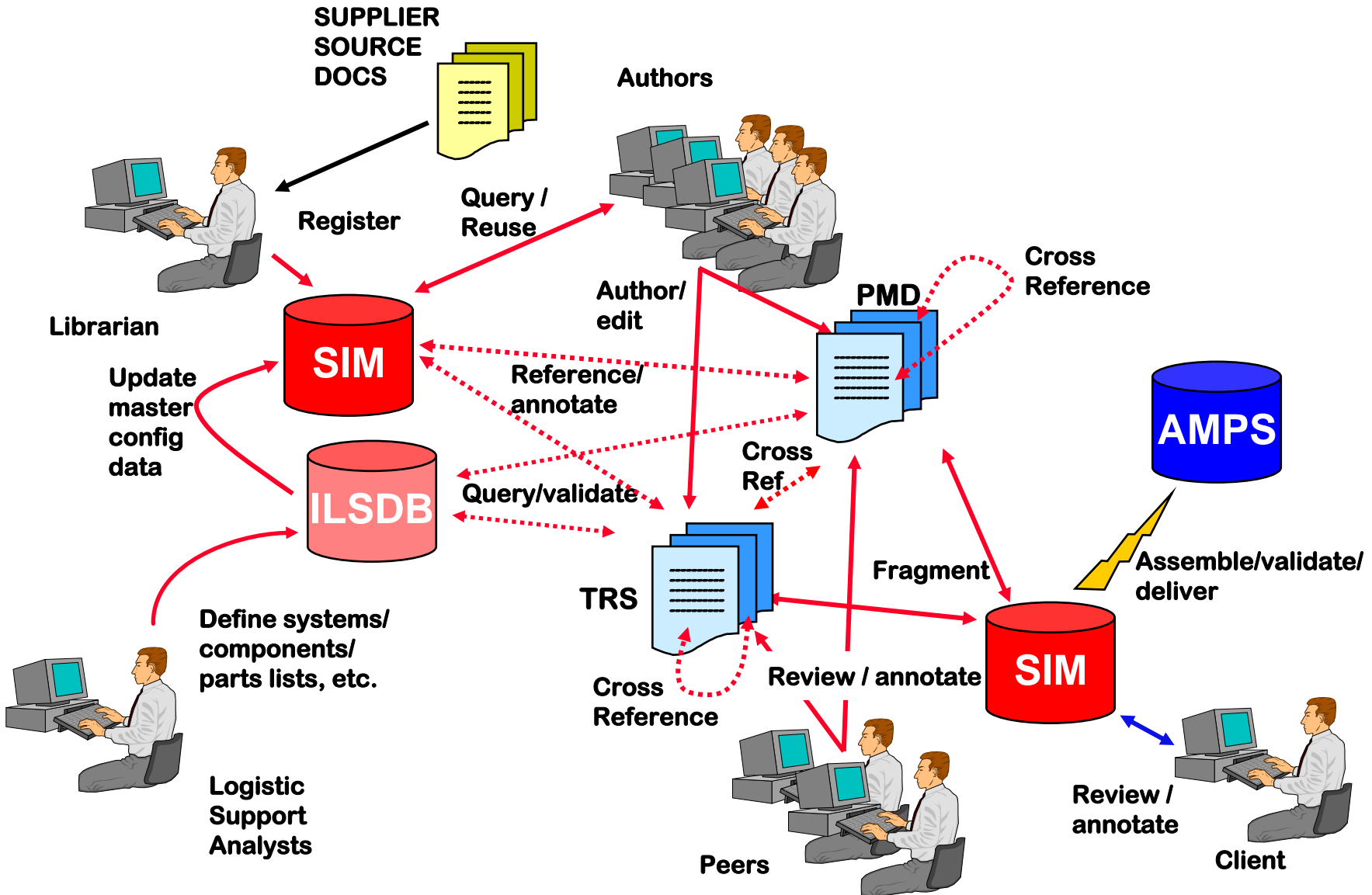
SOURCEREGISTRY Meta Data View

PubDocNo:	ABR 6187
TitleEtc:	Fan Group Switchboards for ANZAC Ships
Version:	0
Type:	PMD SGML Document Drafts - pre DVM version 2
FileFormat:	
SourceFileName:	TBA
Location:	ILS library
Remarks:	TBA
Author:	TBA
Publisher:	TBA
Sponsor:	TBA
SourceData:	No binary to Extract.

OK



Web authoring





CSARS: **C**lass **S**ystems **A**nalysis **A**nd **R**eporting Software

- ◆ **Tenix's TE&V role with OARRS**
 - We were required to collect and analyse 10 ship-years operational data to prove we met contractual availability targets
 - Data collection completed 19 Oct 00
 - ILS TE&V completion Dec 01
- ◆ **Fleet operators needed improved software tool for analysing 'actual' system & equipment performance closer to real time**
- ◆ **Means of conducting:**
 - Reliability
 - Availability
 - Maintainability
 - Sustainability

RAMS Analysis



Measures for RAMS

- ◆ **Reliability = MTBF = (op hrs / failures)**
- ◆ **Availability = A_o = uptime / (uptime + downtime)**
- ◆ **Maintainability = MTTR = avge (TTR)**
- ◆ **Sustainability = MLDT = avge (job time - ADT - TTR)**



CSARS: What does it do?

- ◆ **Collects & validates operational data**
 - Retrieves downtimes, corrective maintenance job details from AMPS
 - Validates data
- ◆ **Calculates**
 - Performs RAMS calculations
 - Reports RAMS results
- ◆ **Analyses**
 - Facilitates ad-hoc system analysis
 - Isolates deficient equipment within system
 - Helps to identify causes of equipment deficiency



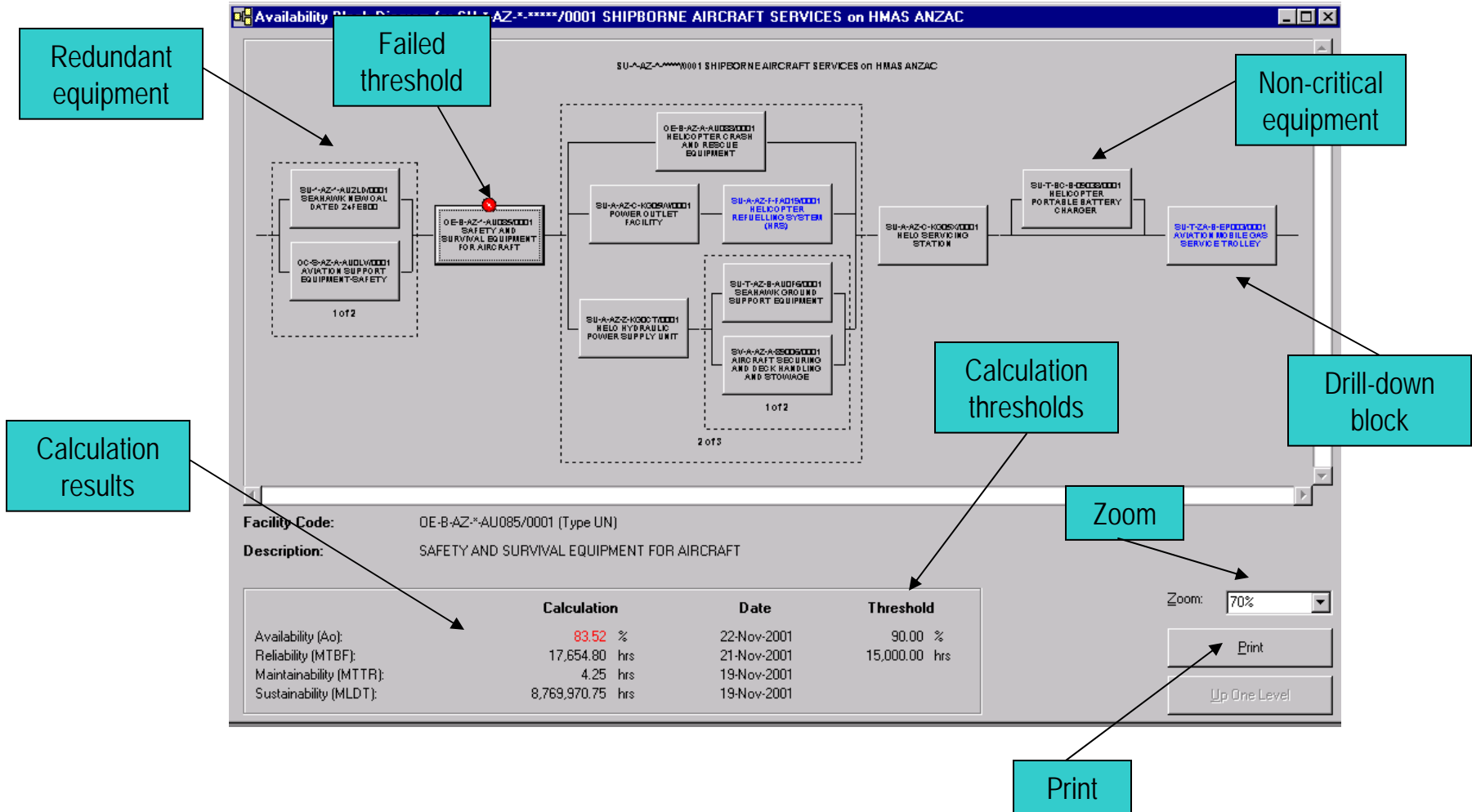
Where does CSARS help?

- ◆ **Feedback to improve operational knowledge ("continuous improvement")**
 - Data collection and reporting mechanisms
 - Org, Intermed & Depot level planned maintenance
 - Estimating required inventory for "surge" capacity
 - Input to life-cycle costing tools
- ◆ **Informed Decision Making**
 - Determine existing capability
 - Prioritise tasks for maintenance
 - Manage repairables and materiel support
 - Determine effectiveness of support
 - Prioritise systems for cost analysis



CSARS: What does it look like?

Availability Block Diagram:





Summary: How TENIX closes the circle

