

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

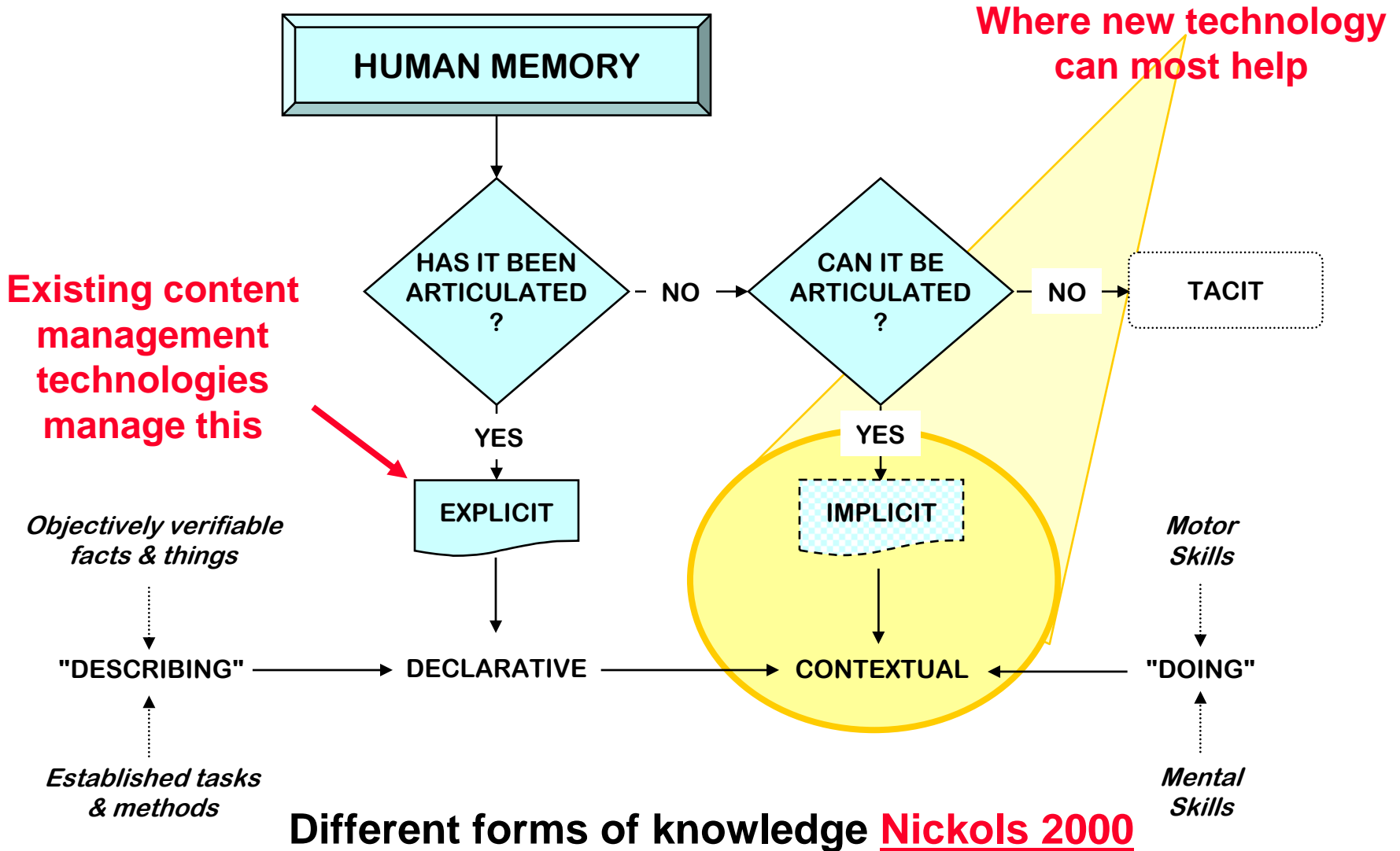


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**The Big Picture: Managing
fleet technical knowledge over
the project lifecycle**



Tacit and explicit knowledge in organisational contexts





Major issues for a fleet operator

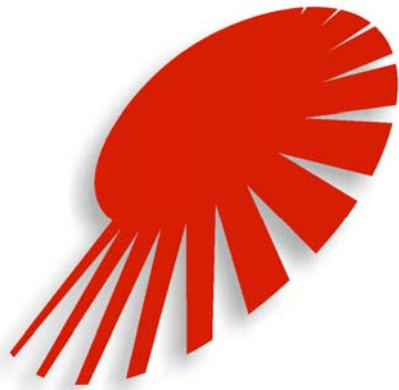
- ◆ **Capability when it is needed**
 - **Reliably** does what it is supposed to
 - **Available** for service when needed
 - **Maintainable** - problems can be fixed when they arise
 - **Supportable** - critical needs available in supply chain
 - **Operable** within limits of human knowledge & capacity
- ◆ **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

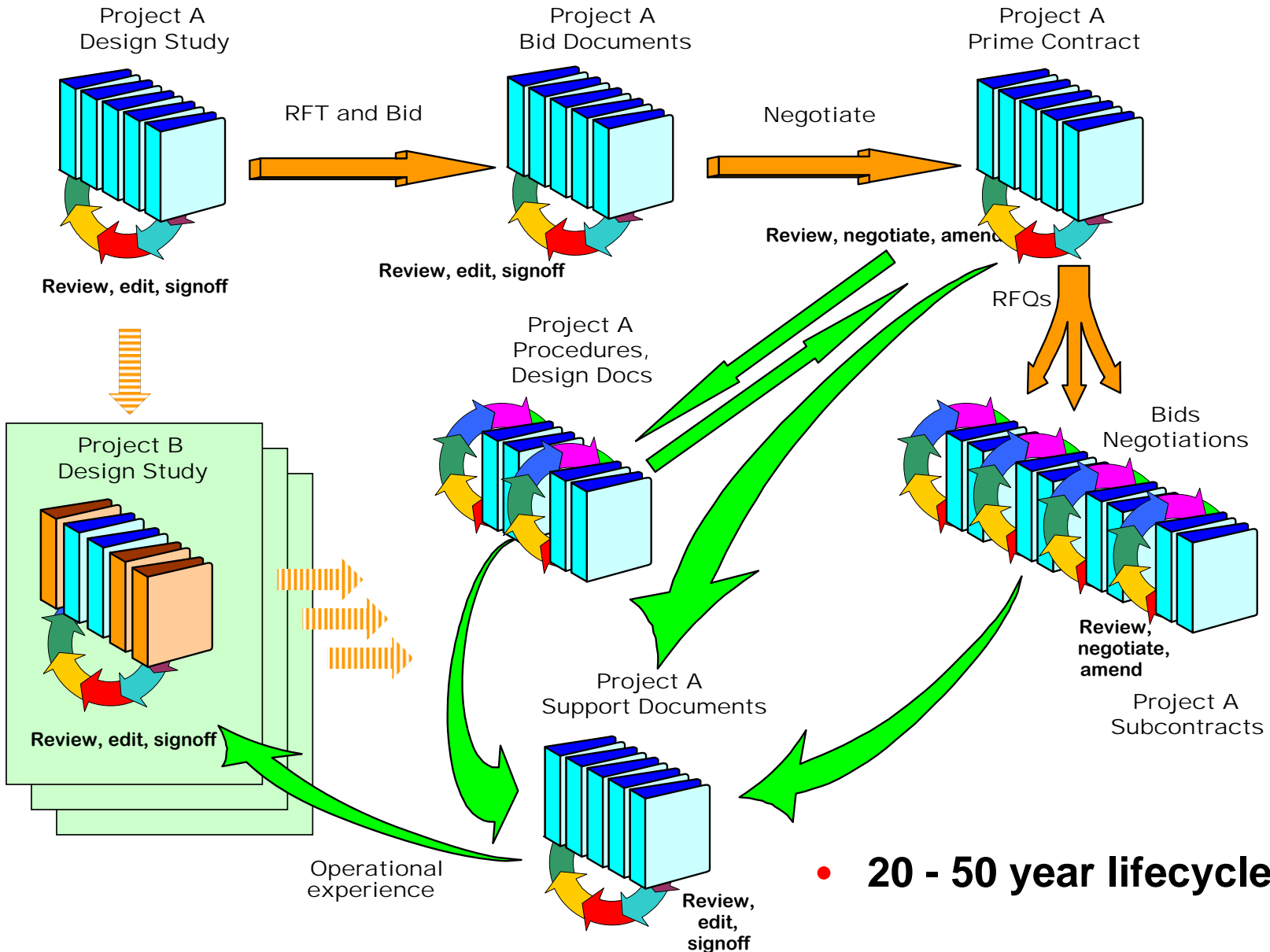
- ◆ **Committed to implement state of the art technical data management including IP development**
 -  **Interactive Link / DataGate for secure computing**
 - **Telelogic's DOORS requirements management**
 - **SpeedLegal's SmartPrecedent content authoring system**
 - **Structured authoring and content 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



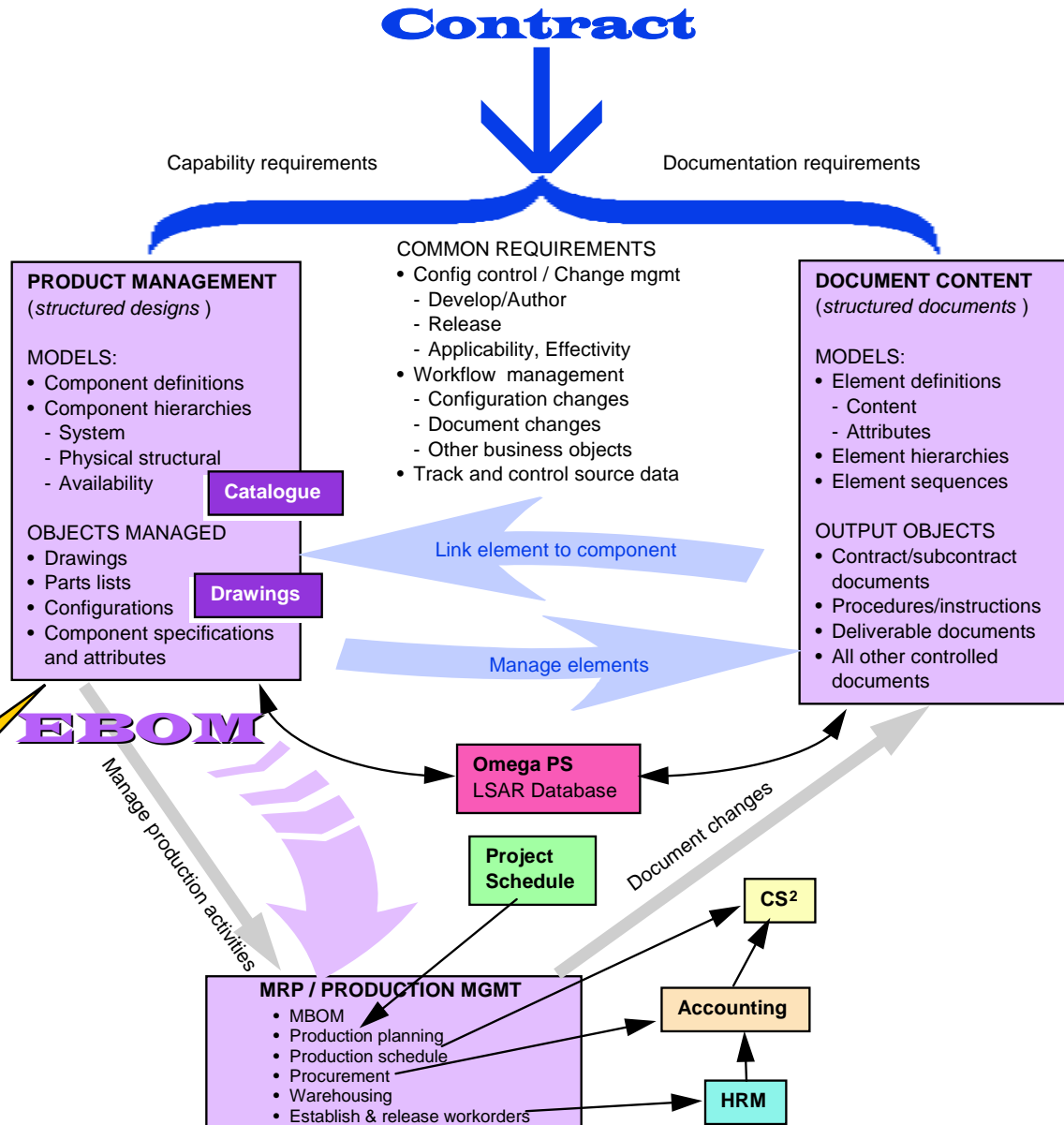


A CM/PDM “umbrella” integrates the pieces

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

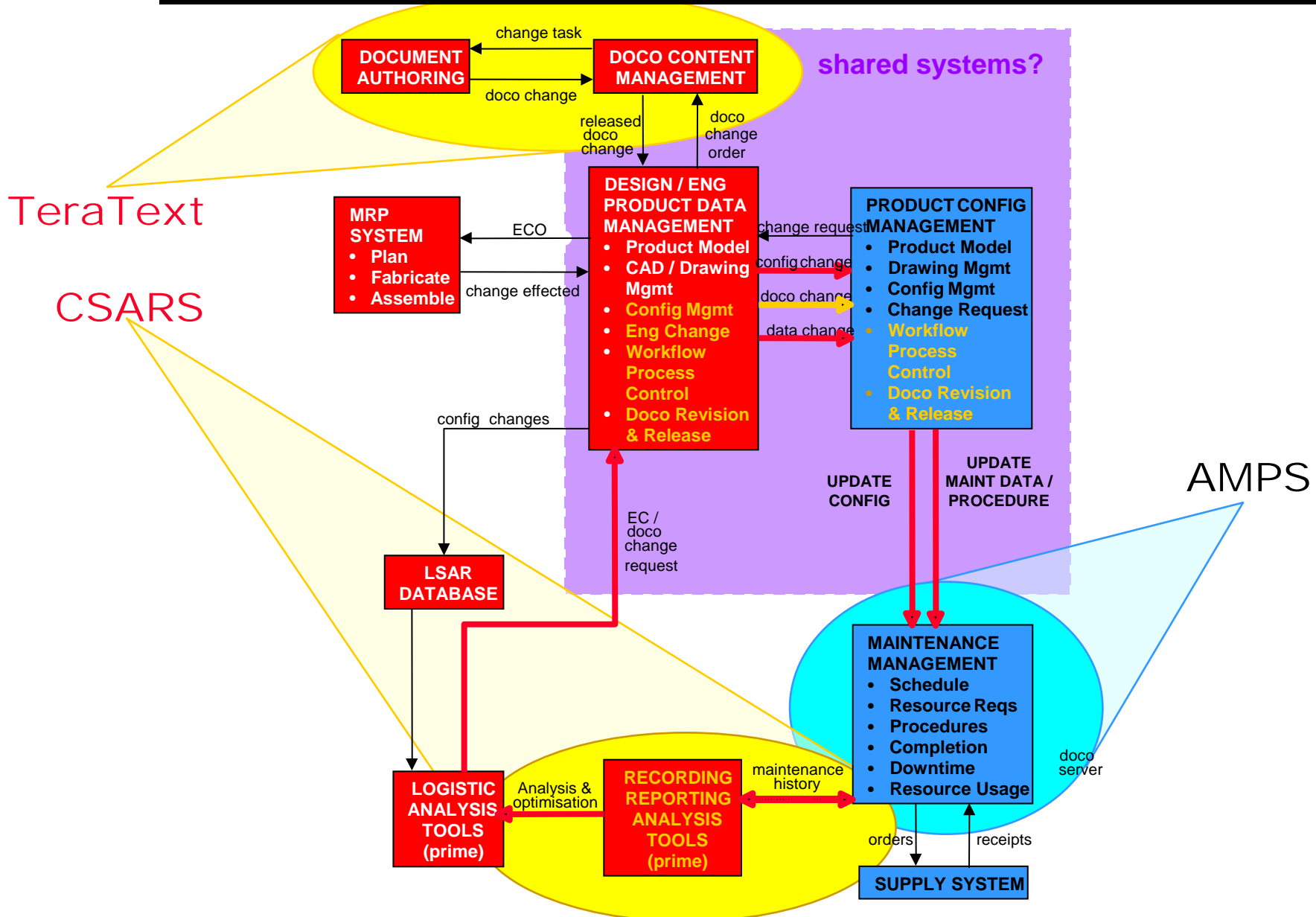
See [eMatrix](#), [Windchill](#), [TeamCenter](#)

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

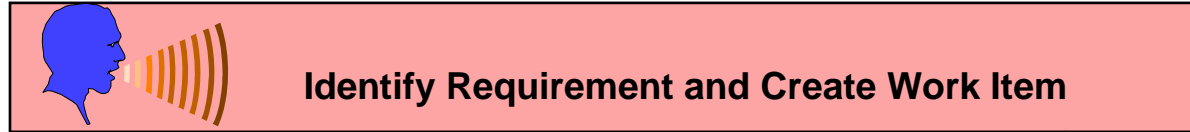
◆ 100% sales & support in NA and Europe



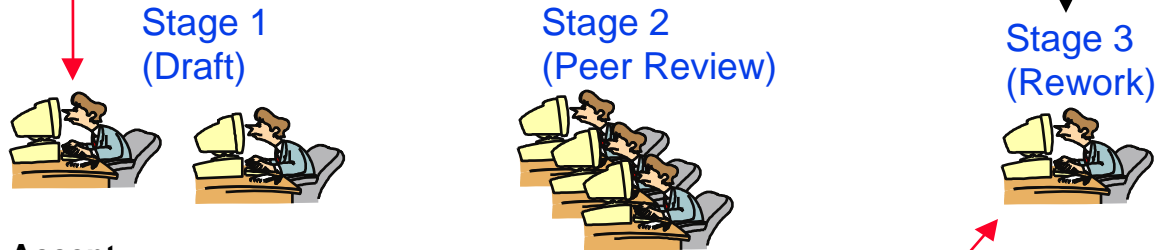


TeraText's role based workflow for ANZAC Ship maintenance procedures

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**

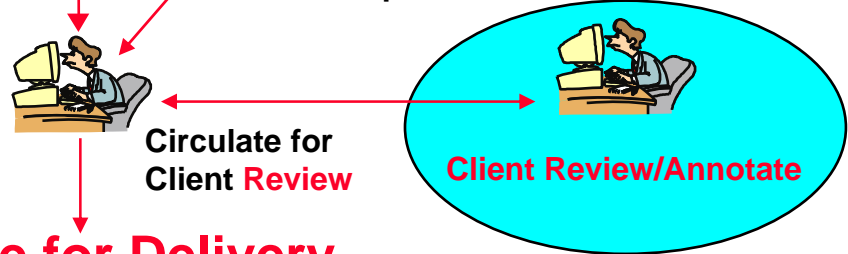
View
Annotate
Sign-Off as Reviewed

Supervisor Sets Peer Review Completion

Accept
Check Out
Check In
Release for QA Review

Stage 4 (Client Review)

QA/Supervisor



Release for Delivery



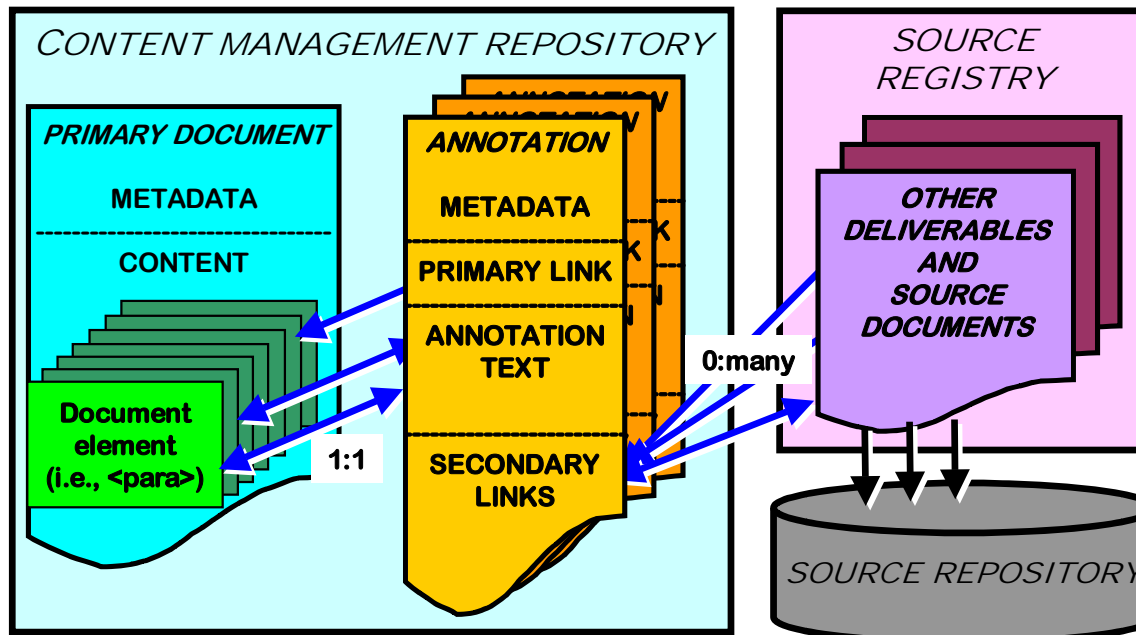
Tenix's ANZAC measured improvements from structured authoring and content management

- ◆ **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

Annotation may be added here

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

- 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.

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

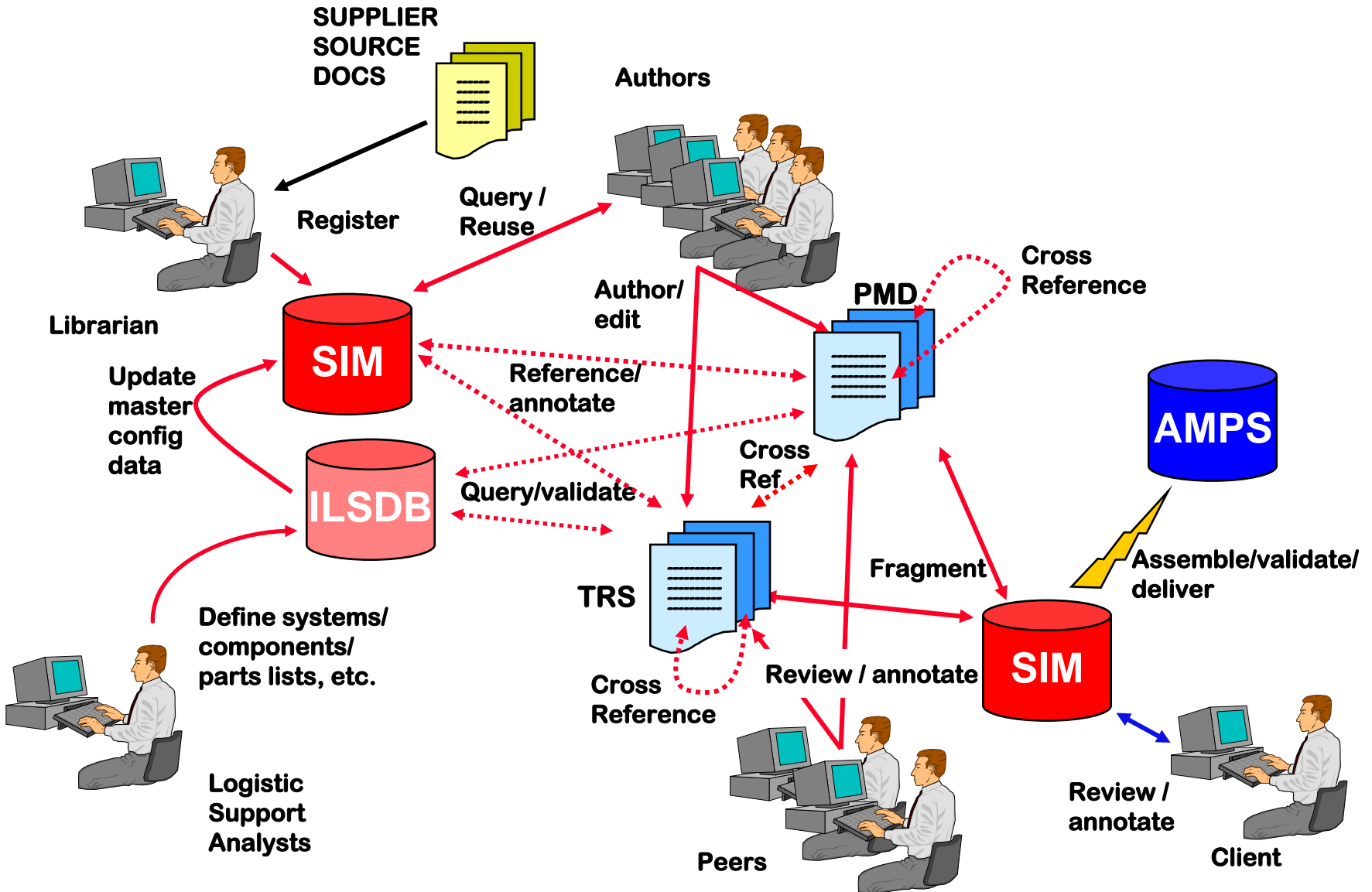
SOURCEREGISTRY Meta Data View

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



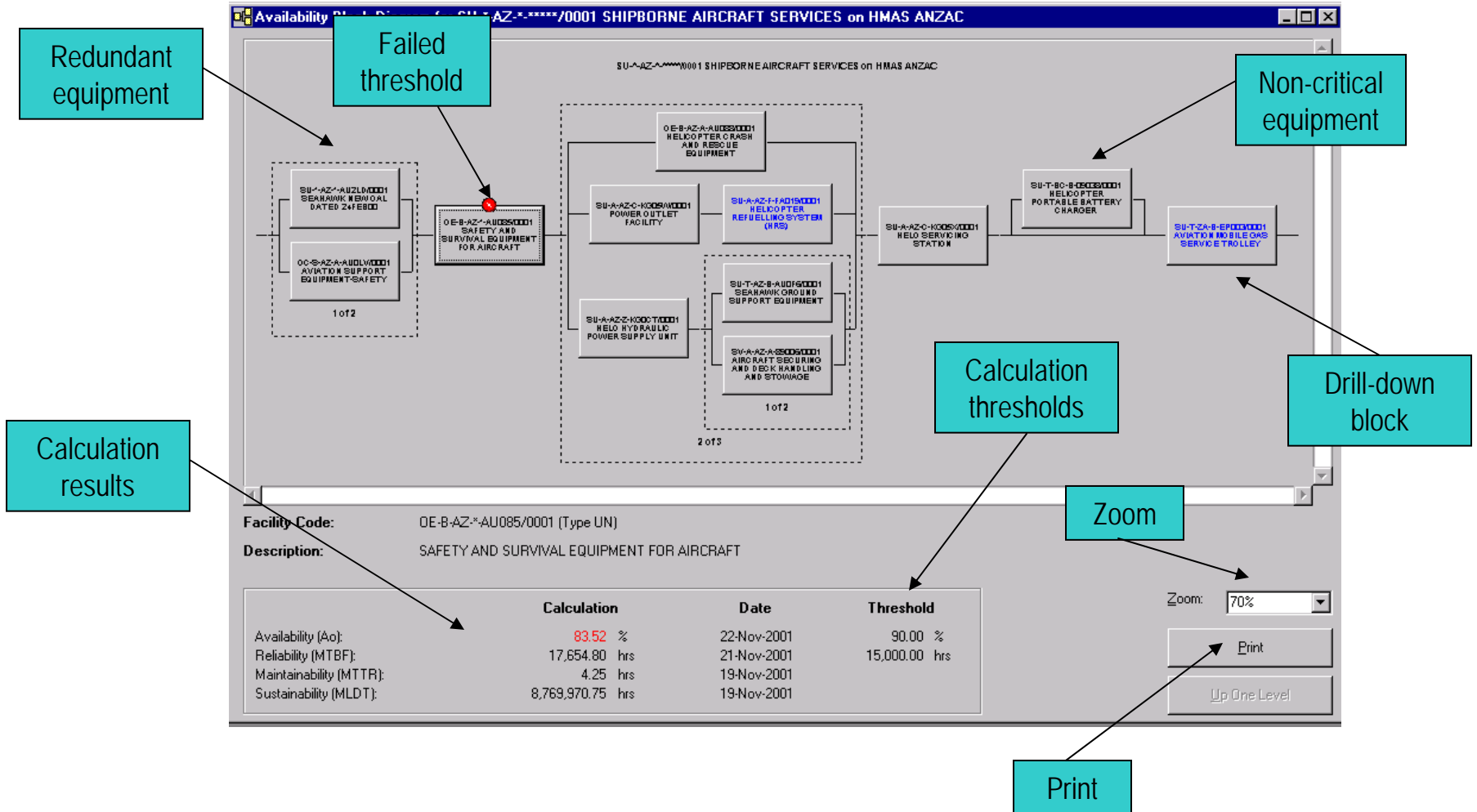
Where does CSARS help?

- ◆ **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

