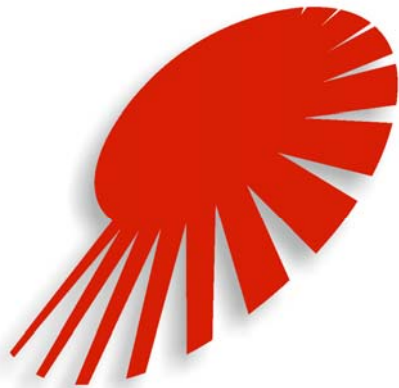


TENIX DEFENCE



Tenix™

A technology architecture for managing explicit knowledge over the entire lifecycle of large and complex projects

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20 November, 2002)



Outline

- ◆ **2:00 A technology architecture for managing explicit knowledge over the entire lifecycle of large and complex projects**
 - **Theory and contextual framework for content management**
 - Project management issues and goals to be met by a project knowledge management architecture
 - The flows of knowledge within and between various stages of the project lifecycle
 - **Case study**
 - Essential technologies
 - Integrating the winning solutions
 - Some real measures of success
- ◆ **3:20 Afternoon refreshments**
- ◆ **3:40 Presentation continued...**
 - **Extending Web technology**
 - Closing the fleet knowledge management circle
 - Managing knowledge in the front end of the project cycle
 - Discussion
- ◆ **4:40 Chair's closing remarks**



Contexts

◆ What is an intranet?

- A communications network for members of a defined group
- Part of an organisational memory and nervous system (James Martin's [Cybercorp](#))

◆ What is content?

- Explicit information and knowledge captured, stored and retrieved via the organisational memory and nervous system.

◆ What is content management?

- Processes
- Technologies
- Tools
- **Content management is much more than document management**

◆ Work in progress

- Theory
- Bottom up or opportunistic application



Threads in my story



Personal Threads

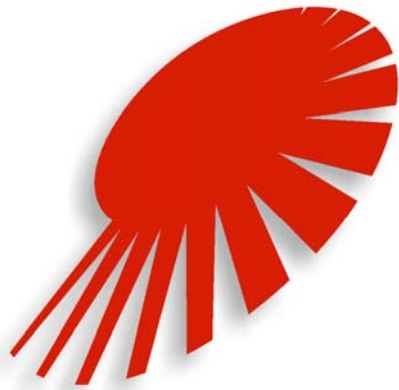
- University physics and PhD in evolutionary biology
- Experience using all [generations of computer technology](#)
- 2 Yr postdoc studying scientific revolutions and the theory of knowledge
- 20 yrs computer literacy & technical writing
- 12 yrs defence industry
- Military affairs as a fertile literature
- 10 yrs working with maintenance documentation systems
- Organisational knowledge management
- Systems implementation from a low level in the organisational hierarchy



Outline of presentation

- ◆ **Part 1: Theory: What is it that needs to be managed and delivered**
 - **Managed content = explicit knowledge**
 - **Knowledge and document *paradigms* as management issues**
 - **Organisational imperatives**
 - **Organisational learning and adaptation**
- ◆ **Part 2: ANZAC Ship Project**
 - **Paradigmatic issues**
 - **Practice**
 - **Bids and contracts**
 - **Maintenance knowledge**
 - **Technology applications**
- ◆ **Part 3: Extensions**

PART 1



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**Theory and contextual
framework for content
management**



Part 1 - Introduction

- ◆ **Major revolutions are changing the nature of knowledge itself and technology to manage it**
- ◆ **Organisational knowledge managers need to understand these changes and content management needs to evolve in response**
- ◆ **Corporate intranets: content is knowledge**
 - **Different paradigms of knowledge**
 - **Authors assimilate data and information into knowledge**
 - **Knowledge is distilled into content people can find and use when they need to know something.**
 - **Corporate analogue to personal memory**



Revolutions in human cognition and technologies for recording and transmitting knowledge

- ◆ **Evolution of human cognition now driven by technological change rather than genetic change**
 - We humans have reinvented our ecological roles in the ecosphere a number of times as we invented new ways to build and transmit knowledge
- ◆ **5 cognitive revolutions have fundamentally changed our nature.**
 - These relate to how humans gain and use non-genetic "knowledge"
 - The last is the fastest and most profound, and is taking place well within our own lifespans.



Profound cognitive revolutions

- ◆ Evolution of vertebrate memory and learning - *perhaps 500 M years ago* (enabled by slow genetic change)
- ◆ Evolution of speech and teaching to transfer knowledge from one human memory to another via the spoken word - *perhaps 500 K years ago* (genetic + cultural evolution)
- ◆ Physical counters, tallies, writing and reading used to record and transmit knowledge external to human memory *> 5-6 K years ago* (cultural evolution)
- ◆ Printing and spread of universal literacy transmit knowledge to the masses - *550 years ago* (cultural + individual change)
- ◆ Knowledge automation tools and the Web to manage knowledge externally to the human brain - *15 years ago* (revolutionary individual changes)
 - On June 26, 2000, Google announced that it had indexed over one billion Web pages
 - On 12/09/2002 Google indexes 2,469,940,685 Web pages
 - [Deep web](#) is 400-500 times this size (Michael Bergman)



Epistemology - Theory of Knowledge

- ◆ **Paradigms and cognitive revolutions**
- ◆ **What is knowledge?**
- ◆ **"Objective" vs "personal" knowledge**
- ◆ **Knowledge and adaptation**
- ◆ **Individual knowledge vs organisational memory**



Paradigms

- ◆ **The difference between evolution and revolution**
 - **Evolution = incremental change**
 - **Slow process with easy stages**
 - **Easy for language to keep up**
 - **Revolution = discontinuous change**
 - **Rapid changes with multiple simultaneous impacts**
 - **Requires conceptual frame shifts (i.e., implicit shifts in entire world views)**
- ◆ **Paradigms relate to revolutionarily different world views**
 - **Sequential over many generations**
 - **May persist side-by-side for some time within a generation**
 - **May identify competing disciplines**
- ◆ **Those seeking to change organisations through implementing content management need to recognise the revolutionary nature of the changes**



Thomas Kuhn's paradigm concept

- ◆ **Thomas Kuhn (1962), The Structure of Scientific Revolutions**
 - ***Symbolic generalisations*** — deployed by authors without question or introspection, and immediately understandable by the group,
 - ***Models*** — including those with heuristic and metaphysical presumptions that provide the group with preferred analogies or even with an ontology, and
 - ***Exemplars*** — which are unquestioned and accepted concrete examples of how to solve particular kinds of problems or of what constitutes "good" science — i.e., paradigms in the common English usage of the term.
 - ***Values*** — in the sense providing a predictive or epistemic value: "values to be used in judging whole theories: they must, first and foremost, permit puzzle-formulation and solution; where possible they should be simple, self-consistent, and plausible, compatible, that is, with other theories currently deployed"



Incommensurability

- ◆ Kuhn's term derives from the mathematical concept of incommensurability, and arises from the largely tacit [in the standard English sense of the term] nature of a paradigm.
- ◆ Kuhn (1962) developed the concept in the framework of scientific "revolutions", where there was a historical progression from an earlier paradigm (disciplinary matrix) to a newer one.
 - Scientific revolutions may occur when new observations no longer fit within an existing paradigm (the observations are anomalous).
 - Some anomalies can only be accommodated in theory based on new exemplars, models and/or symbolic generalisations.
 - These changes often require new vocabulary and often alter the meaning and connotations of existing vocabulary. Even where the same words are used within each of the paradigms, there is often no longer a direct logical correspondence in their meanings.
- ◆ The world view (symbolic generalisations, models, exemplars and their associated theory-laden vocabulary) held by practitioners of one paradigm is logically incommensurable with that held by the alternative paradigm.
- ◆ **Even though users of different paradigms look at the same data, the worlds they see and describe are filtered through their paradigms and thus the differences in interpretation cannot be rationally compared.**
- ◆ **Impacts on business cases!**



Document paradigms: paper vs content

- ◆ **Paper:** A physical (or electronic) object consisting of one or more formatted pages covered with printing or writing
 - Focus on form and style
 - Scribes, typewriters, word processors control form and style
 - Onus is on the author to determine formats
 - Difficult for computers to identify contexts
 - Computer can index but not understand content

- ◆ **Content:** Sets of containers to capture and transmit knowledge for comprehension and action
 - Focus on logic and content - form and style a by-product
 - Structured authoring
 - Select containers to semantically identify knowledge contained
 - Enter the knowledge
 - Content management and processing
 - Semantically parsable markup
 - Can be “intelligently” processed by computers



Knowledge paradigms: What is knowledge?

- ◆ **The deep philosophical questions**
 - How do we know?
 - What do we know when we think we know something?
 - Do we need to discriminate between fact and fantasy?
 - Why are these questions important?



Two paradigms of knowledge

◆ Objective Knowledge - Karl Popper

- Professor of philosophy interested in science
- One of 20th Century's greatest philosophers
- Logic of Scientific Discovery (German - 1934, English 1959); Conjectures and Refutations (1963); Objective knowledge: An Evolutionary Approach (1972)
- **The basis for scientific objectivity**

◆ Personal Knowledge - Michael Polanyi

- Professor of chemistry interested in philosophy
- Near Nobel laureate in physical chemistry
- Personal Knowledge: Towards a Post-Critical Philosophy (1958); The Tacit Dimension (1966)
- **the basis for personal belief**



Popper's bottom line for objective knowledge

- ◆ "Criticism" remains the crucial determinant for knowledge
 - real knowledge – as opposed to fantasy and myth, is logically and objectively connected to reality by multiple links that have survived rational attempts to test and falsify them.
 - Hypotheses that do not usefully predict reality are discarded as being demonstrably untrue (i.e., natural selection applies to the evolution of knowledge as well as to a species' genes).
 - Knowledge evolves and grows through time by proposing increasingly bold hypotheses that survive vigorous testing against reality.
- ◆ Basis for today's discipline of "evolutionary epistemology" that has applications in [artificial intelligence](#) and [complex systems](#)



Paradigm of personal knowledge

- ◆ "We know more than we can tell"
 - The emphasis on "tacit" knowledge in organisational knowledge management
- ◆ Quoting [K.E. Sveiby \(1997\)](#) on Polanyi
 - True discovery, cannot be accounted for by a set of articulated rules or algorithms
 - Knowledge is public and also to a very great extent personal (i.e. it is constructed by humans and therefore contains emotions, "passion")
 - **The knowledge that underlies the explicit knowledge is more fundamental; all knowledge is either tacit or rooted in tacit knowledge.**
 - Knowledge is an activity which would be better described as a process of knowing. Polanyi thus regards knowledge as both static "knowledge" and dynamic "knowing". When the dynamic properties are emphasised, He uses verbs like knowing or learning. The dynamic properties describe how human beings strive for acquiring, coming to know, new knowledge.

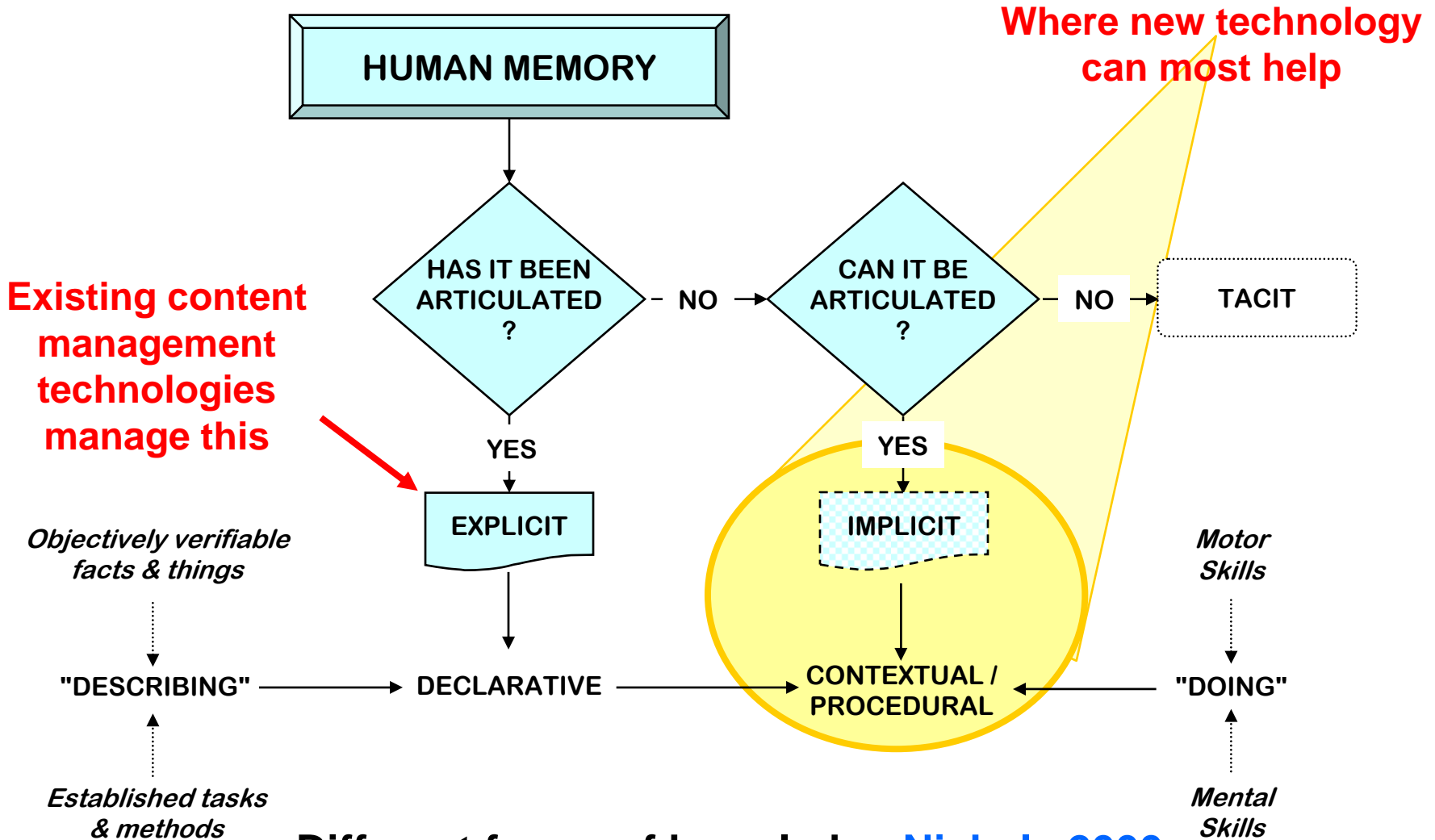


Incommensurable paradigms of knowledge: London School of Economics - 1951

- ◆ The two professors at the heights of their academic careers in England met at LSE ([Watkins, 1997](#))
 - Both refugees from European authoritarianism
 - Polanyi - Professor of Chemistry, Manchester University
 - Faith and belief were Polanyi's antidotes to authoritarianism
 - Popper - Professor of Philosophy, LSE
 - Objective reality was Popper's antidote to authoritarianism
- ◆ Polanyi presented on "The Stability of Beliefs" in Popper's Philosophy of Science [seminar](#)
 - The younger, arrogant, moralistic and prejudiced Popper made it clear he did not consider Polanyi to be a worthy peer
 - Polanyi – a truly eminent scientist – was "gravely offended" by Popper's treatment
- ◆ In their subsequent master works neither author referenced the other's existence except in single, trivial footnotes
- ◆ This applies even today within the organisational knowledge management discipline - one reason why content managers have problems with the knowledge management literature.



Tacit and explicit knowledge in organisational contexts



Existing content management technologies manage this

Where new technology can most help

Different forms of knowledge [Nickols 2000](#)



What is information?

- ◆ **"Information"**
 - a very generic term for descriptions of the world, and
 - a particular level in a hierarchy of epistemic quality
- ◆ **Information (1) is a catch-all term for representations of the world in the form of transmissible or persistent content conveying something meaningful about that which exists.**
- ◆ **"Epistemic quality" is a relative measure of what an actor can do with the information. The higher the information quality, the more useful or valuable the information is likely to be.**

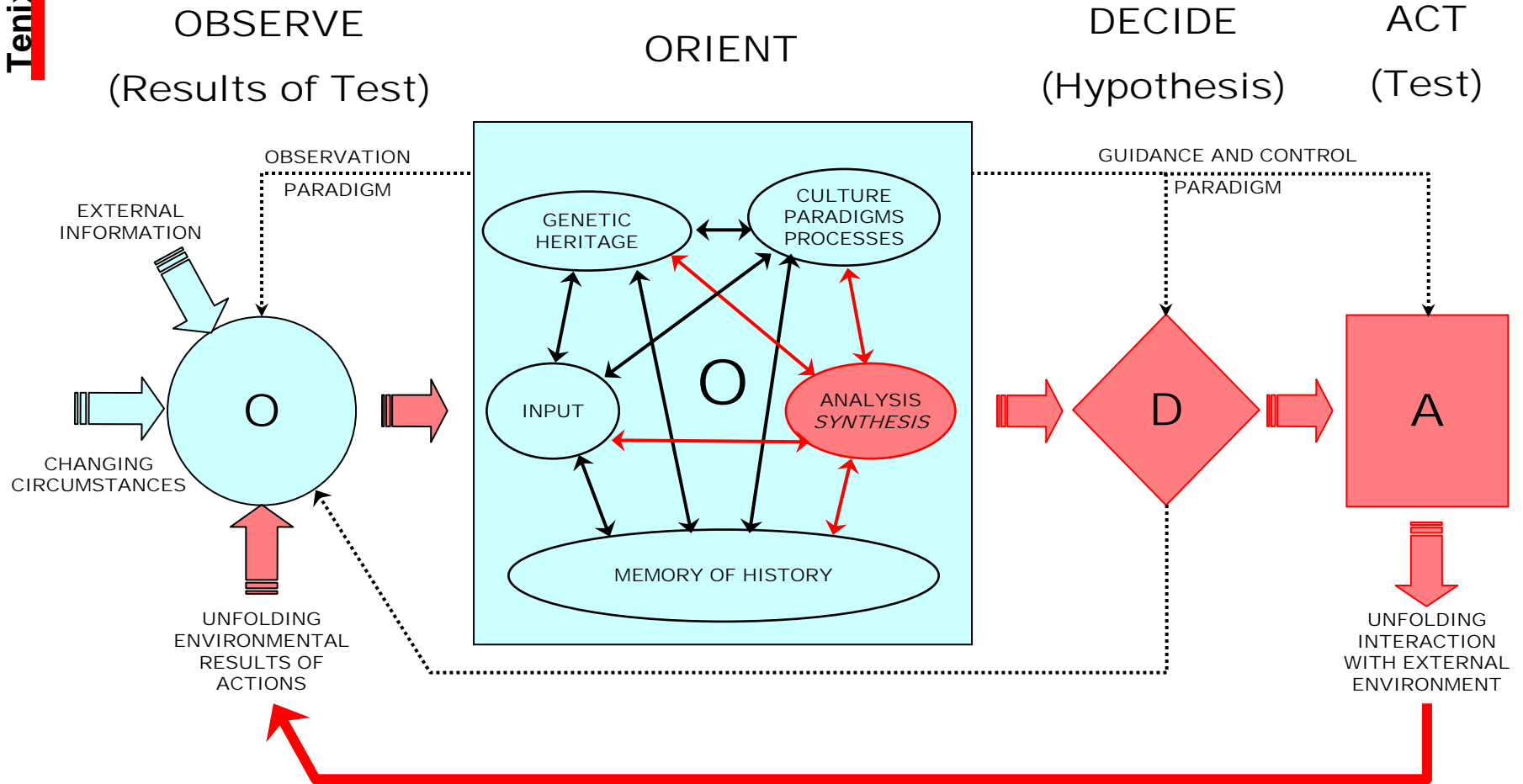


Transformations add epistemic quality (a.k.a. WIKID Power)

- ◆ **Data** is the raw state of information, i.e., binary or character strings without context or syntax
 - transformed by providing context and syntax (i.e. relationships)
- ◆ **Information** is data that has been given a context by relating it to other items of data in a syntax
 - transformed by assimilation (into a human memory) and semantics (meanings)
- ◆ **Knowledge** is information that is made useful because it is semantically assimilated into a body of information grounded in experience. Explicit knowledge is assimilated information that can be transmitted for others
 - transformed by human assessment and selection
- ◆ **Intelligence** (in the military sense) is knowledge that has been assessed and evaluated
 - transformed by intelligent hypothesis and action (testing against reality)
- ◆ **Wisdom** is intelligence that has survived (probably repeated) testing
 - transformed by applying wisdom and control
- ◆ **Power** (in the strategic sense) is the result of applying wisdom to gain or maintain control over external circumstances.



Building organisational knowledge: Boyd's OODA Loop (feedback cycle)



◆ **The success of an entity or organisation in competition depends critically on doing a better job to assimilate and increase the epistemic quality of information, and to reduce decision cycle times to generate strategic power. See [War, Chaos and Business](#). Intranets work at light speed!**



Relating OODA terms to the WIKID Power transformations

- ◆ **Observation** assembles **data** (raw perception) into **information** about the world in which the entity exists (including the entity's own effects and those of its competitors on that world). **Data is given a context** relating to the entity's interactions with the world.
- ◆ **Orientation** processes **information** into **knowledge** in the form of a world view comprised of new information, memories of prior experience (which may be explicit, implicit or tacit), genetic heritage (i.e., "natural talent"), cultural traditions (i.e., paradigms), and analysis (destruction of the existing world view), and synthesis (or creation) of a revised world view including possibilities for action. This **generates intelligence** (military term).
- ◆ **Decision** Chooses an action to try from possibilities generated by orientation. **Choice is governed and informed by wisdom** based on prior experience gained from previous OODA cycles, informed by synthesis (creation) of new possibilities to try.
- ◆ **Action** involves putting the decision to test by applying it to the world. The loop begins to repeat as the entity observes the results of its action. **Entities who can complete the OODA process faster and better, and thus act before competitors, control the shared environment to attain strategic power.**



What does orientation comprise for the organisation

- ◆ **Input **information****
 - Results of latest actions
- ◆ **Processed into **knowledge** as guided by**
 - Individual members' genetic heritage
 - Capabilities
 - Natural talent
 - Organisational memory = Assimilated observations of external reality
 - Results of prior actions
 - Records
 - Documents (distilled knowledge)
 - Culture, paradigms and processes
 - Explicitly / implicitly learned / mandated methodologies
- ◆ **Analysis and synthesis create **intelligence****
 - Reasoning, reaction, theory building



Organisational knowledge (WIKID Power)

- ◆ **Value is added** to the result as information is transformed from one stage in the hierarchy to the next.
- ◆ In an organisational context, **knowledge is the assimilated information or organisational memory able to be exchanged between members of the organisation or preserved and transmitted through time to guide behaviour and support decisions.**
- ◆ Compared to an individual's knowledge, which is lost when the individual leaves the organisation, **organisational knowledge is represented in culture, processes and document content that exist independently outside individual memory.**



Strategic power is **the bottom line** for most organisations

- ◆ **Strategic power to control events in the world is gathered and built by entities able to complete their OODA cycles faster and more effectively than their competitors.**
 - **The competitor with the more complete and accurate picture of the world is more likely to achieve the predicted results from an action than will be the case for a competitor with a less complete and accurate picture.**
 - **An entity that can decide and act in less time than a competitor alters reality so it no longer conforms to the competitors' observations of the world.**
- ◆ **The entity holding strategic power makes the world appear to be chaotic to less powerful entities.**

Case Study Context



**Generic ideas applied to
specific circumstances**

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Who invented concept of content management

◆ DARPA NET

- US Defense Advanced Research Projects Administration
- ~ 1970 first Internet protocols for mainframes
- TC/IP adopted as Defense standard in 1980
- ~1985 beginning to connect desktop computers

◆ SGML - ISO 8879 (1986) and the Web

- IBM and electronic typesetting for technical documents
- Basis for HTML and World Wide Web (1990)
- First HTML Browser was Mosaic (1993)
- XML (~2000)

◆ CALS Standardisation

- Computer-aided Acquisition and Logistic Support (1989)
- Continuous Acquisition and Lifecycle Support
- Commerce at Light Speed



Defence projects

- ◆ **Specific requirements of defence projects are often ahead of commercial understanding**
- ◆ **Initial implementations may be very specific, but test and demonstrate concepts well in advance of commercial applications**

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A technology architecture for managing explicit knowledge over the entire lifecycle of large and complex projects

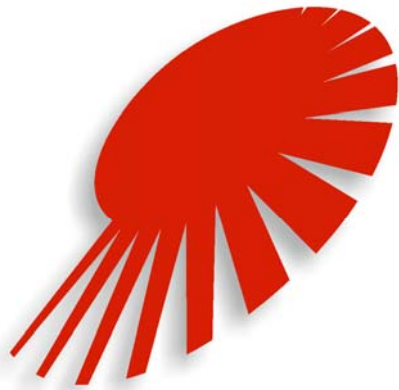
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20 November, 2002)

Part 2: Tenix Case Study



Tenix™

**Managing and
delivering knowledge
in the real world**



Some background on Tenix

- ◆ **Tenix Group - \$A .7 BN turnover, ~3,000 staff**
 - **Largest Australian Defence Contractor**
 - **Divisions**
 - **Naval and commercial ships (e.g., Tenix ANZAC Ship Project)**
 - **Land, air and electronic systems**
 - **Infrastructure & support**
 - **Products**
 - **Ships**
 - **Land vehicles**
 - **Electronics**
 - **Fleet related activities & services**
 - **Project management**
 - **Systems design & 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
- ◆ **\$A 6 BN fixed price contract!**

#5 commissioned 31 March 2001

M113 Upgrade Project



- ◆ ~ 350 Vehicles
 - 22 identified variants
 - Long life-span

- ◆ Progressive upgrade
 - New systems
 - New documentation



What content do we need to manage?

- ◆ **Source documents received from suppliers, clients & standards organisations**
- ◆ **Commercial documentation**
 - Bids
 - Contracts
 - Correspondence
- ◆ **Engineering and production documentation**
- ◆ **Deliverable documentation**
 - Plans
 - Training materials
 - Technical and operating manuals
 - Maintenance procedures



What is our intranet

- ◆ **Organisational webs**
 - Intra departmental
 - Intra divisional
 - Inter divisional

- ◆ **Product related webs**
 - Authors
 - Reviewers
 - Internal
 - External
 - Knowledge users



How do we need to manage web content

- ◆ **Capture/manage source documents**
- ◆ **Author, review, publish workflow**
- ◆ **Versioning and change management**
- ◆ **Validate elements of content**
- ◆ **Maintain**
- ◆ **Index, search and retrieve**
- ◆ **Support reuse**



ANZAC Ship Project's ILS imperatives

- ◆ **Stringently fixed price contract**
- ◆ **Includes total integrated logistic support (ILS) package**
 - **Plans**
 - **Spares allowances and initial stocks**
 - **Maintenance documentation**
 - **Training**
- ◆ **Operational availability warrantee**
 - **80% for full combat capability**
 - **90% for designated "critical systems"**
 - **Tenix responsible to fix any shortfalls in fixed price**
- ◆ **Test, Evaluation and Validation of the ILS package**
 - **ILS test period 10 ship-years of operational experience**
 - **Required to develop Operational Availability Recording and Reporting System (OARRS) to prove the package**

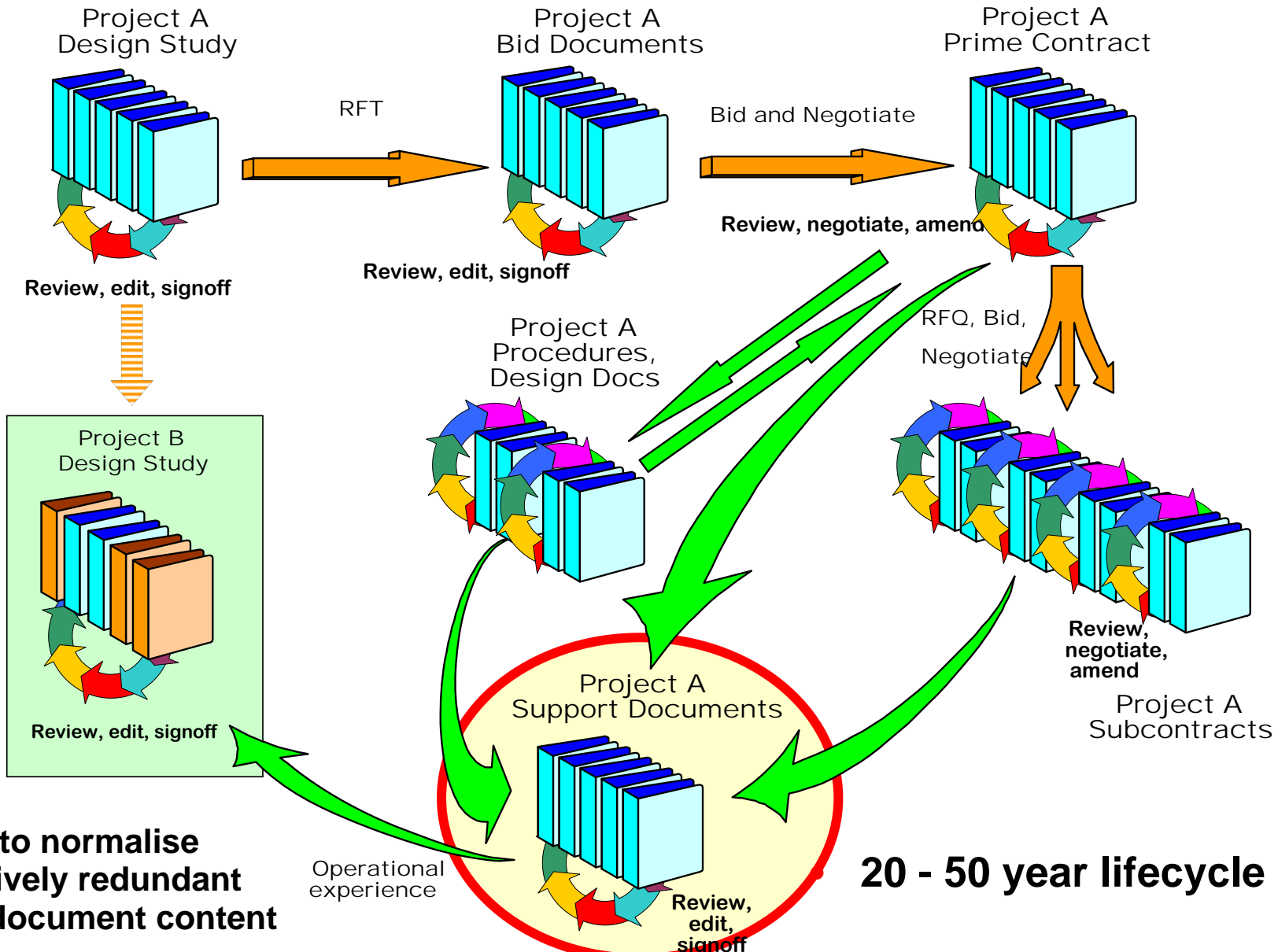


Tenix's internal environment for content mgmt

- ◆ **Paradigmatic differences**
 - Some stakeholders don't understand difference between paper and content
 - Need for change identified at the coal face, not by executives
- ◆ **Tacit knowledge management is people management**
- ◆ **Problem areas where we can improve**
 - Project management
 - Process reform
 - Innovation
- ◆ **We need to do it faster, better, cheaper!**
 - Paper vs the electronic (intranet) distribution of content
- ◆ **Fleet support content management is basically an engineering solution**
 - Explicit knowledge is more tangible to engineers than implicit or tacit
 - Effective content management can identify, codify and make implicit knowledge explicit
- ◆ **Web-based authoring, management and maintenance of logistic support documentation shows the way**



Simplified doco cycle for a large project



Need to normalise massively redundant data/document content

Operational experience

20 - 50 year lifecycle



Major issues for a fleet/facility operator

- ◆ **Capability when you need it**
 - Effectivity
 - Operability
 - Maintainability
 - Availability
- ◆ **Health & safety**
- ◆ **Life-cycle cost**
 - Minimise total cost
 - Minimise support & maintenance costs

All issues depend on effective authoring, management and transfer of technical content from supplier to operators



Object lessons: what happens when content isn't accessed or isn't available

- ◆ **RAN supply ship Westralia**
 - HMAS [Westralia Tragedy](#) Board of Inquiry 1998
 - Published configuration change procedures not followed
 - Broken high pressure fuel hose caused engine room fire
 - Four died, ship disabled for four years.

- ◆ **ESSO [Longford Gas Plant](#)**
 - Longford Royal Commission 1999
 - Appropriate documentation did not exist/was not available
 - Hot oil supply lost, gas separator became frozen and brittle, broke and caused explosion when hot oil supply returned.
 - Two died, Victorian gas supply interrupted for three weeks causing \$ 1 BN disruption to business.



Know your organisational imperatives

- ◆ **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**

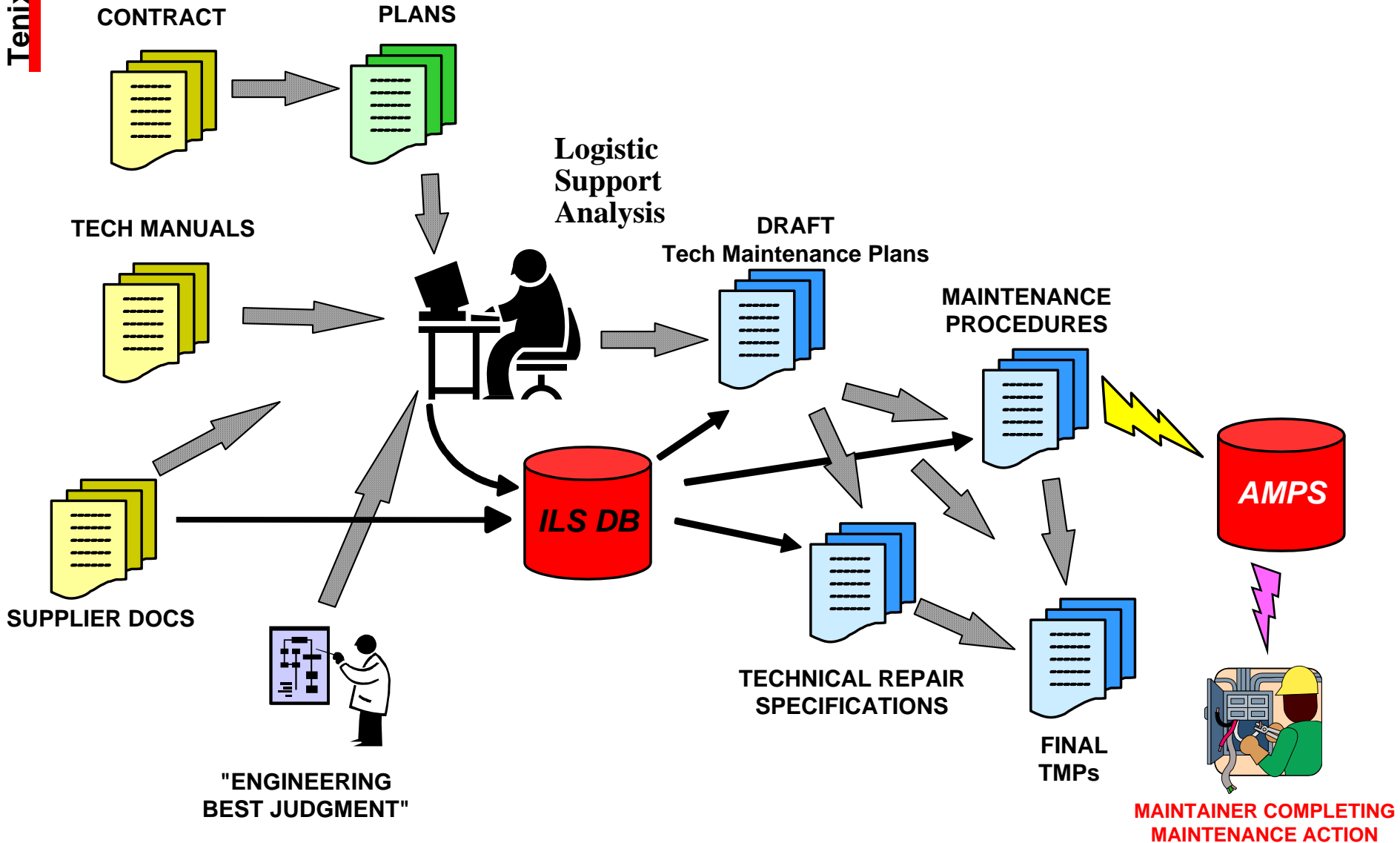


Document content (DCMS) and product data (PDM) management replace paper with electrons

- ◆ Effective knowledge mgmt maximises efficiency
- ◆ Conceptual tools
 - Query and discover (**know what you know**)
 - Structure and control electronic authoring environments
 - Capture contexts (**convert implicit to explicit**)
 - Reuse existing knowledge (**write once, use many times**)
 - Establish and reuse precedents
 - Share common elements
 - Route electronically (**progress at light speed**)
 - review
 - approval
 - tracking and reporting
 - Manage and track changes (**better QA, audit**)
 - Link to other business processes
 - requirements analysis (**are you meeting the contract?**)
 - Awareness (**early warning**)



Knowledge flow into maintenance procedures (Paper paradigm!)



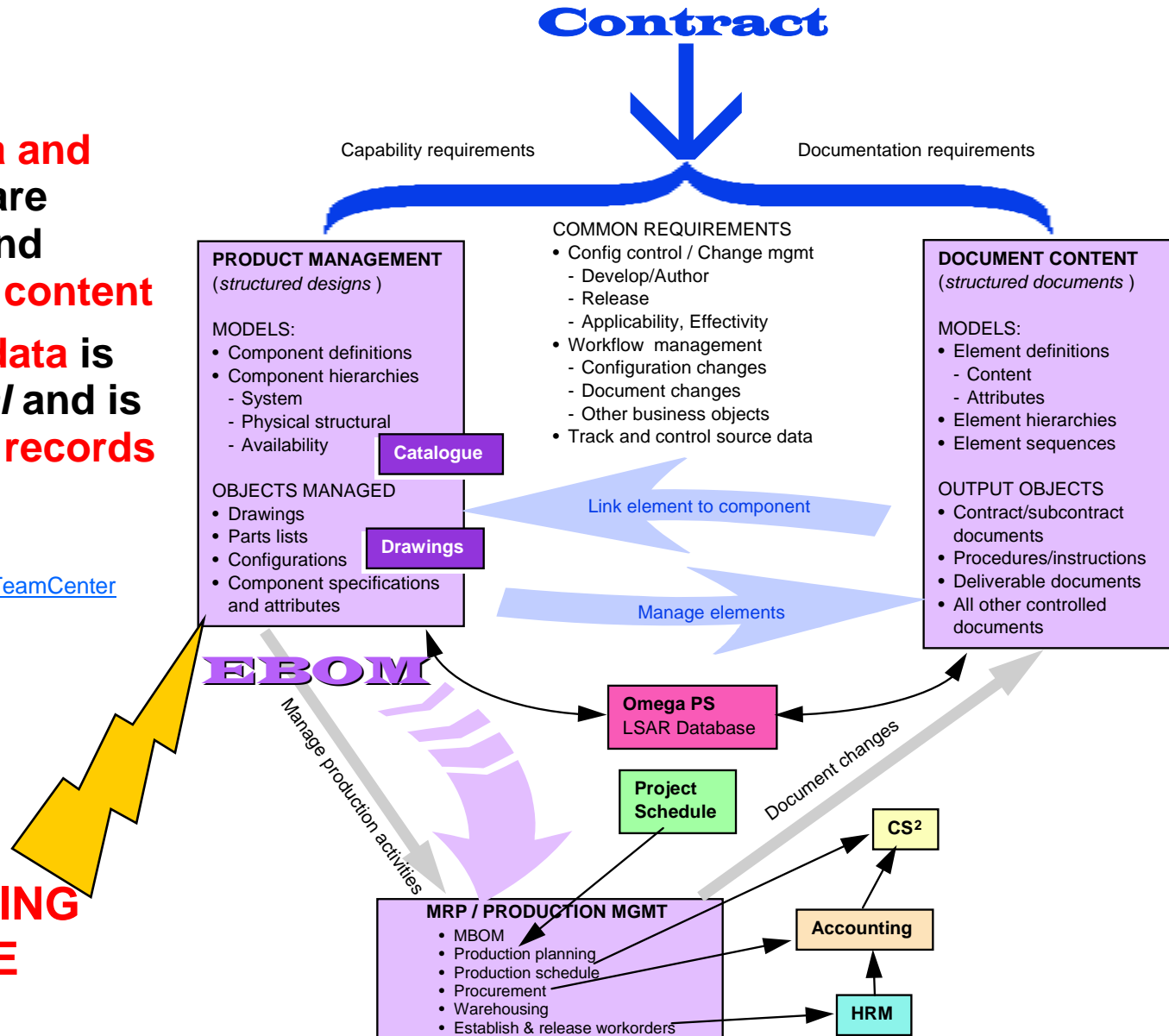


A CM/PDM “umbrella” integrates the pieces

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

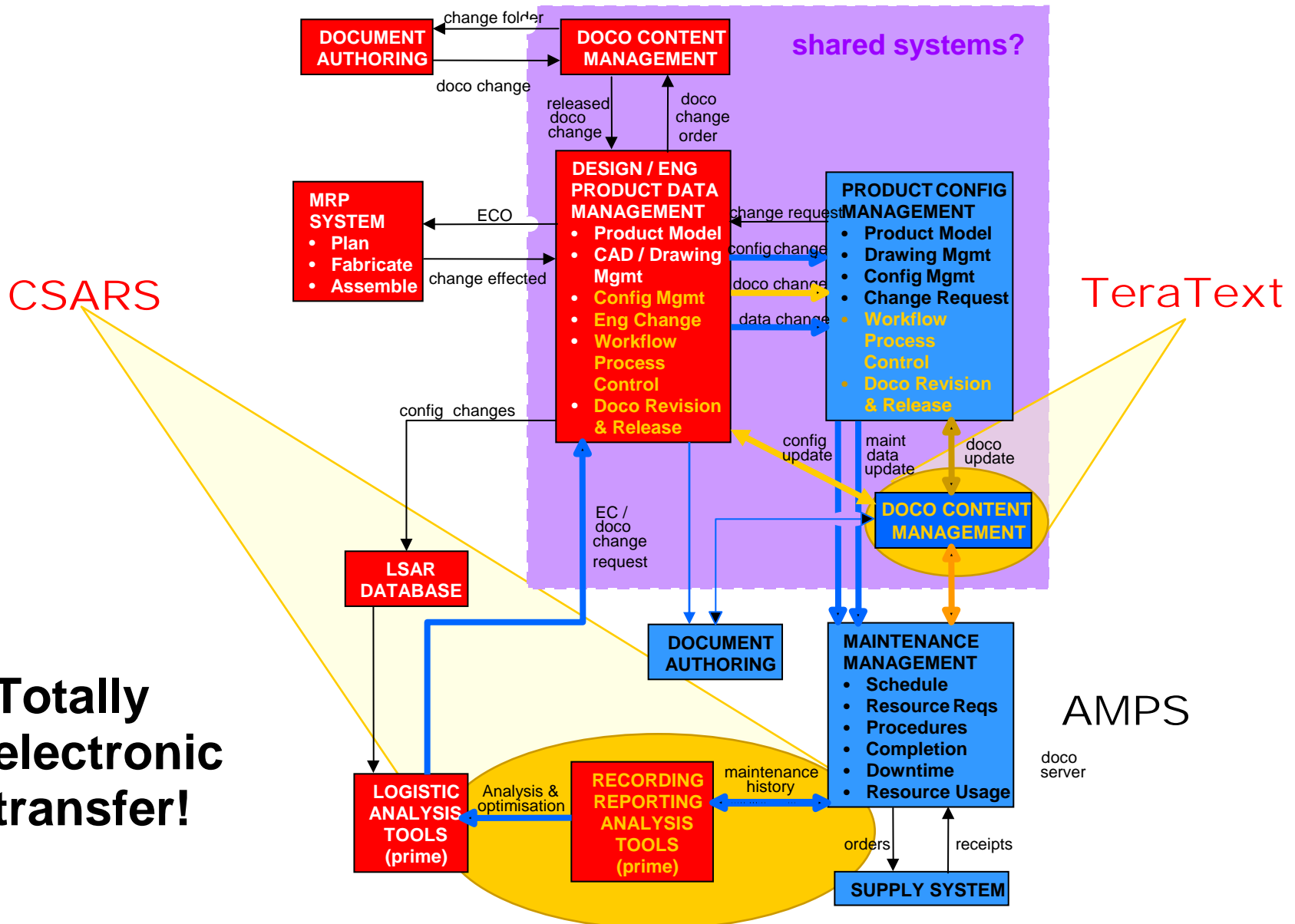
See [eMatrix](#), [Windchill](#), [TeamCenter](#)

ENGINEERING CHANGE





Providing better knowledge management for ANZAC Ship in service support



◆ **Totally electronic transfer!**



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

RMIT Multimedia Database Systems: <http://www.mds.rmit.edu.au>

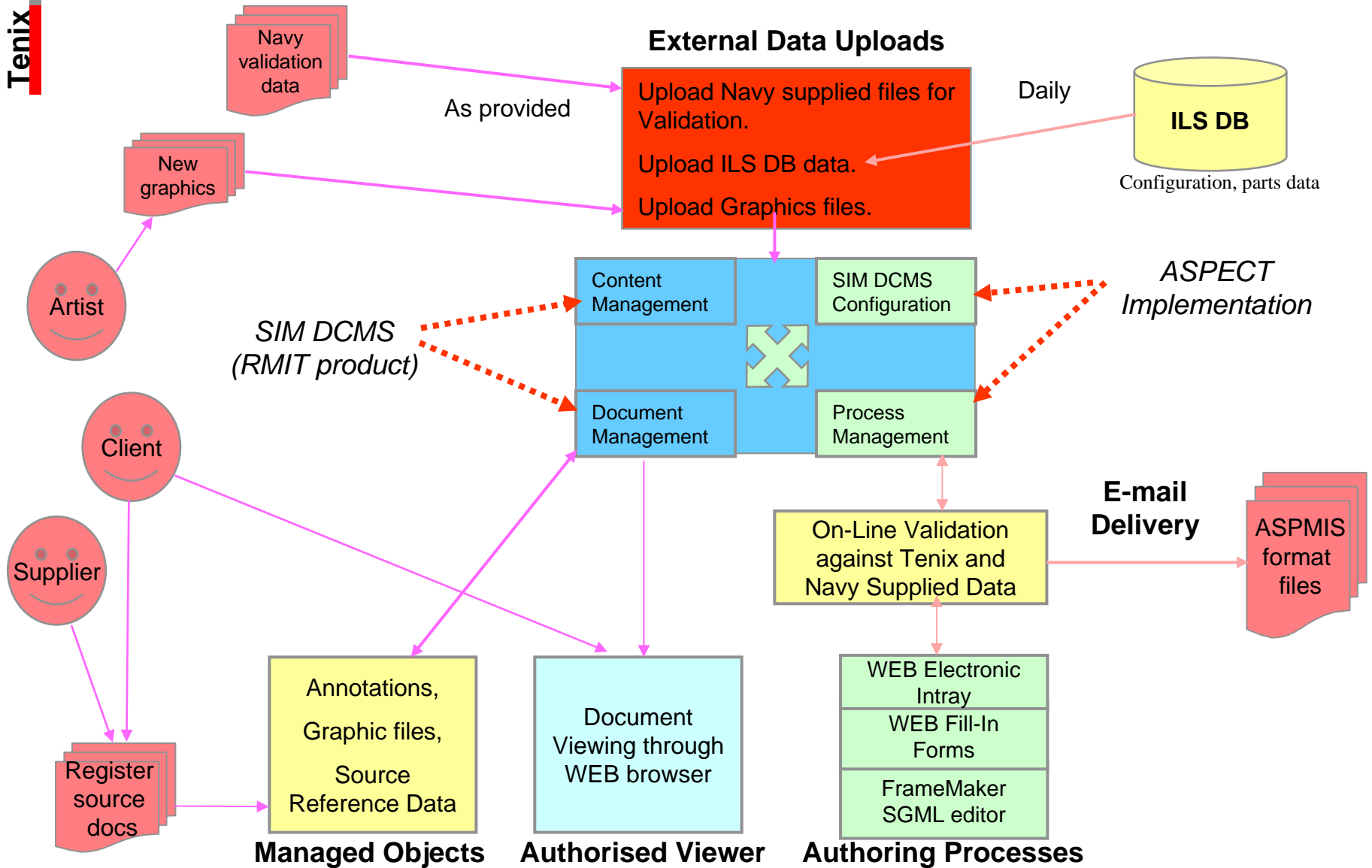
InQuirion Pty Ltd: <http://www.inquirion.com>

TeraText: <http://www.teratext.com>





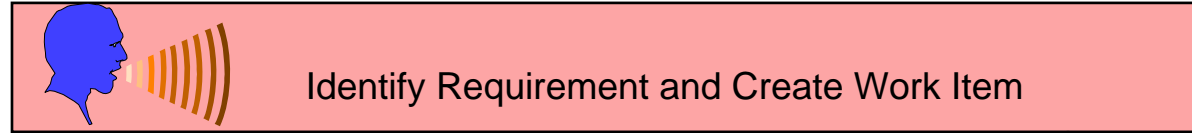
SIM DCMS architecture



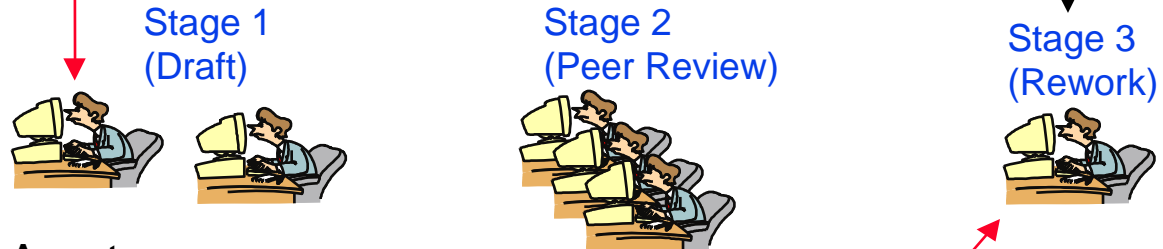


TeraText's role based workflow for ANZAC Ship maintenance procedures

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

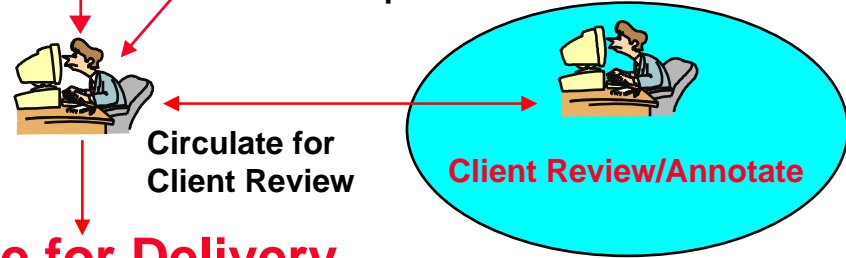
**View
Annotate
Sign-Off as
Reviewed**

**Supervisor Sets
Peer Review Completion**

**Accept
Check Out
Check In
Release for QA Review**

**Stage 4
(Client Review)**

QA/Supervisor



Release for Delivery



SIM DCMS

SIM DMS - Microsoft Internet Explorer

Back Forward Stop Refresh Home Search Favorites History Mail Print Edit

Address <http://a992941:6062/>

File Edit View Favorites Tools Help

Links Best of the Web Channel Guide Customize Links Free HotMail Internet Start Microsoft

 **Tenix**
Rel 1_4.3

 **Tenix**



Work Filter Records Search Convert ASPMIS Session



DCMS
Document Content Management System

Done Local intranet



Author Check-in/Check-out

SIM DMS - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print Edit

Address http://hawk:6062/worklists/My%20Work%20In%20Progress/1

Tenix Rel 1_3.3

Work Filter Records Search Convert ASPMIS Session

Create New Work Workitems Unallocated Work My Work In Progress

My Work In Progress

Current User: hallb Current Page: 2

Work Details	MRC ID	Author Instructions	EC	State	Work Tasks	Due Date	Checked Out
H Details	CLASS-513-02-O-W-2-O-R-A0000480-50	Class, Rev. 5	51302	ReDraft	21	02 Aug 2000	Yes
H Details	CLASS-516-02-O-W-2-O-R-A0000545-60	Class, Rev. 8	51602	ReDraft	21	02 Aug 2000	No
H Details	CLASS-521-03-O-W-2-O-R-A0000554-90	Class, Rev. 9	52103	ReDraft	21	02 Aug 2000	No
H Details	CLASS-521-04-O-W-2-O-R-A0000563-100	Class, Rev. 10	52104	ReDraft	21	02 Aug 2000	No
H Details	CLASS-524-02-O-W-2-O-R-A0000591-70	Class, Rev. 7	52402	ReDraft	21	02 Aug 2000	No
H Details	CLASS-533-02-O-S-1---A0001277-1(06/03/1997)	Class, Rev. 6	53302	Draft	5	07 Aug 2000	No
H Details	CLASS-555-05-O-S-1---A0000695-8(07/06/2000)	Class, Rev. 9	55505	Draft	5	14 Aug 2000	No

12

Local intranet

Cancel Check-in

Check-in

Check-out

Release to QA

Release to Peer Review



Work Flow Icons

ACTION

ICON

Accept authorship of changes	
Accept authorship of redrafting changes	
Release document after drafting (authors)	
Release document after re-drafting (authors)	
View	
Sign off (peer reviewer)	
Checkout	
Return to worklists	
Update Metadata	
Cancel Checkout	
Check in	
Complete check in	
Update Metadata	

SIM DMS - Microsoft Internet Explorer

Address <http://a992941:6062/Search%20ool/view/dma%3A%2F%2F%2Fcms%2F1ec68a40-5323-11d5-9c8b-00508b04af6e%2Fguid%3Dfbaafa80-68db-11d4-b2b2-0050da06bfb4/0>

File Edit View Favorites Tools Help

Links [Best of the Web](#) [Channel Guide](#) [Customize Links](#) [Free HotMail](#) [Internet Start](#) [Microsoft](#)

Tenix Rel 1_4.3

Work Filter Records Search Convert ASPMIS Session

View Document Profile

Document Profile [Annotation Report](#) [Done](#)

[standard activity](#) [mrc code](#) [cmc triggers](#) [related SA and MRCs](#) [reference publications](#) [maintenance timing](#) [labour requirements](#) [tagout cmc](#) [shutdown cmc](#) [tools](#) [parts](#) [materials](#) [fluids](#) [test equipment](#) [miscellaneous procedure](#)

Standard Activity

Std Activity No.	Revision	IssueStatus	Mandatory Designation	Country	SA Cancel
A0000442	9	DELIVERED	NOT-APPLICABLE	BOTH	0

Description
Inspect shock mounts

top_MRC Code

510 02 O A 1

top_Configuration Item COMPLETE

CMC	Description	Units	Effectivity
SA A AZ A 010P5	CHILLED WATER CIRC PUMP SET	2	Immediate
SA A AZ D 010P6	AIR COND SEA WATER CIRC PUMP SET	2	Immediate

2 configured items against 1 routine

Local intranet

Browser view (2) - misc metadata

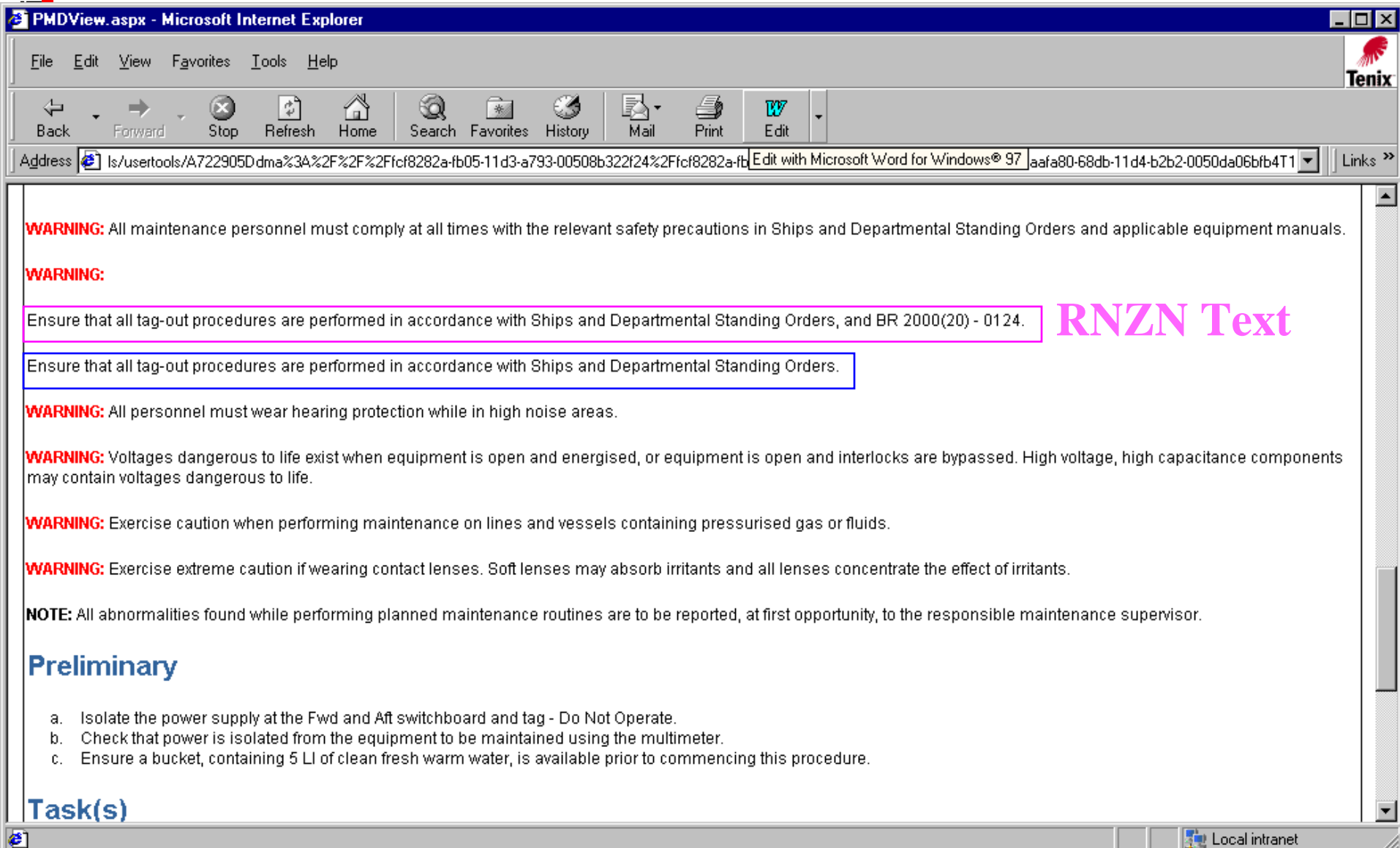
Microsoft Internet Explorer window showing **PMDView.aspx**. The browser address bar contains a long GUID-based URL.

The page content is organized into several sections, each with a "top" link and a "COMPLETE" status:

- Reference Publications**: Includes a table with columns for Country, Publication Number, and Title. A red arrow points to the "Publication Number" column header, and another red arrow points to the value "TEM 4320-0063". A large red text overlay "Two-way link!" is positioned over this section.
- Maintenance Timing**: Includes a table with columns for AU ME05, Estimated Time to Complete, Estimated Maintenance Down Time, and Responsible Work Centre. A red arrow points to the "AU ME05" column header, and another red arrow points to the value "NZ ME02".
- Tag-Out CMC**: A section header.
- Shut Down CMC**: A section header.
- Labour Requirements**: Includes a table with columns for Country, Work Centre, Qualification, and Hours. Red arrows point to the "Country" column header and the values "NZ" and "AU". A large red text overlay "Navy specific work centres, labour codes" is positioned over this section.
- Tools**: Includes a table with columns for Country, ILSIDN, NSN, Description, Units, and Qty. It lists various tools like wrenches, flashlights, and mirrors.
- Parts**: A section header with the status "NOT APPLICABLE".

The browser's status bar at the bottom shows "Local intranet".

Browser view (3) - dual language texts



WARNING: All maintenance personnel must comply at all times with the relevant safety precautions in Ships and Departmental Standing Orders and applicable equipment manuals.

WARNING:

Ensure that all tag-out procedures are performed in accordance with Ships and Departmental Standing Orders, and BR 2000(20) - 0124. **RNZN Text**

Ensure that all tag-out procedures are performed in accordance with Ships and Departmental Standing Orders.

WARNING: All personnel must wear hearing protection while in high noise areas.

WARNING: Voltages dangerous to life exist when equipment is open and energised, or equipment is open and interlocks are bypassed. High voltage, high capacitance components may contain voltages dangerous to life.

WARNING: Exercise caution when performing maintenance on lines and vessels containing pressurised gas or fluids.

WARNING: Exercise extreme caution if wearing contact lenses. Soft lenses may absorb irritants and all lenses concentrate the effect of irritants.

NOTE: All abnormalities found while performing planned maintenance routines are to be reported, at first opportunity, to the responsible maintenance supervisor.

Preliminary

- Isolate the power supply at the Fwd and Aft switchboard and tag - Do Not Operate.
- Check that power is isolated from the equipment to be maintained using the multimeter.
- Ensure a bucket, containing 5 L of clean fresh warm water, is available prior to commencing this procedure.

Task(s)

Local intranet

Metadata error trapping

PMDEdit.aspx - Microsoft Internet Explorer

Address 1:6062/tools/usertools/A60337362936Ddma%3A%2F%2F%2Fcms%2F1ec68a40-5323-11d5-9c8b-00508b04af6e%2Fguid%3D228d0000-7978-11d5-8e5d-0050da06fb4T2/refresh

File Edit View Favorites Tools Help

Links [Best of the Web](#) [Channel Guide](#) [Customize Links](#) [Free HotMail](#) [Internet Start](#) [Microsoft](#)

Check-Out

[Update Metadata](#)
 [Open in External Editor](#)
 [Return to Worklists](#)
 [Annotation Report](#)
 [Add New Document Annotations](#)

[standard activity](#)
[triggers](#)
[equipment](#)
[miscellaneous](#)
[procedure](#)
[labour requirements](#)
[tagout](#)
[cmc shutdown](#)
[cmc tools](#)
[parts](#)
[materials](#)
[fluids](#)
[test](#)

Stop Lights (Validation)

Standard Activity

Std Activity No.	Revision	IssueStatus	Mandatory Designation	Country	SA Cancel
A0005901	-	DRAFT	Not-Applicable	BOTH	N

Standard Activity No A0005901 is not in list of valid values. **Click the light to see problem**

Clean and inspect the dry air dehydrator

CMC Code

452 01 0 X 5

Configuration Item COMPLETE add 0 new cmc items

del	CMC	Description	Units	Effectivity
<input type="checkbox"/>	CE H V8 C 44000	DEHYDRATOR, NON-REACTIVATING	1	Ec022672

Triggers COMPLETE add 0 new triggers

MRECSTDACTIVITYND4A3276C : fatal : Standard Activity No A0005901 is not in list of valid values.

Local intranet



Browser edit (2) - dual language metadata

PMDEdit.aspx - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print Edit

Address: ols/A652697Ddma%3A%2F%2F%2Fcf8282a-fb05-11d3-a793-00508b322f24%2Fcf8282a-fb05-11d3-a793-00508b322f24%2Fguid%3D4b29f180-681c-11d4-b864-0050da06bfb4T2/display Links >>

Reference Publications COMPLETE add 0 new reference publications

del	Country	Publication Number	Title
<input type="checkbox"/>	Both	TEM 4320-0061	Seawater Cooling Pump - Machinery Space Ventilation

Maintenance Timing COMPLETE add 0 new work centres

Estimated Time to Complete: 0.2 hours

Estimated Maintenance Down Time: 0.2 hours

Responsible Work Centre

del	Country	Work Centre
<input type="checkbox"/>	NZ	ME02
<input type="checkbox"/>	AU	ME05

Labour Requirements COMPLETE add 0 new skill items

del	Country	Work Centre	Qualification	Hours
<input type="checkbox"/>	NZ	ME02	AMT	0.2
<input type="checkbox"/>	AU	ME05	ABMT	0.2

Tag-Out CMC add 0 new tagout CMC items

Shut Down CMC add 0 new shutdown CMC items

Tools COMPLETE add 0 new tool items

del	Country	ILSIDN	NSN	Description	Units	Qty
<input type="checkbox"/>	BOTH	29062	5120 660658507	WRENCH SET, COMB, RING/OPEN, MT, 6-19MM	EA	1

Local intranet

Dual language elements (pointing to NZ/AU and ME02/ME05)

No. of new lines to add (pointing to the 'add 0' field)



Structured authoring environment

The screenshot displays the Adobe FrameMaker+SGML interface. The main window shows a document with the following content:

Note: All oil samples are to be obtained, dispatched and tested using the procedures and equipment laid down in ABR 6107 and ABR 6140.

Conditions

1. Perform after the first 50 hours of operation and then after every 250 hours of operation and after W5 maintenance routine.

Preliminary

a. Turn key switch on Engine Enclosure Fire Alarm System panel to 'TEST' and tag - Do Not Operate.

Task(s)

1. Obtain Lube Oil Sample.

Warning: Drain hot oil with care - danger of scalding. Used oil may contain combustion residue harmful to health. After exposure wash face and hands with warm soapy water.

Warning: Never attempt to disconnect or interfere with coolant, fuel, lubricating oil or compressed air lines when the engine is running unless specifically directed to do so.

Note: Engine oil is to be at normal operating temperature. This task can be done with the engine running.

a. Open the oil sample extraction cock (Fig. 1).

b. Drain off an appropriate amount oil to flush the oil sludge from the extraction cock.

c. Drain approximately 1 litre of oil into a clean container.

d. Using the equipment and chemicals contained in the MTU Test Analysis Kit, check the engine oil for dispersion capability (spot test), water content and fuel dilution.

e. Top up engine oil as required.

f. Remove safety tag and turn key switch on Engine Enclosure Fire Alarm System panel to 'OPERATE'.

g. Send an oil sample to a laboratory for analysis.

Completion

a. Dispose of waste.

Note: Hazardous waste and materials must only be disposed of in accordance with the instructions given in the RNZN Naval Storekeeping Instructions, NZBR 26, Vol.1, Article 0905 (Disposal of Stores at Sea) and current New Zealand Navy Orders concerning Marine Pollution Control and Environmental Protection Policy for HMNZ Ships.

Note: Hazardous waste and materials must only be disposed of in accordance with the instructions given in the RNZN Naval Storekeeping Instructions, NZBR 26, Vol.1, Article 0905 (Disposal of Stores at Sea) and current New Zealand Navy Orders concerning Marine Pollution Control and Environmental Protection Policy for HMNZ Ships.

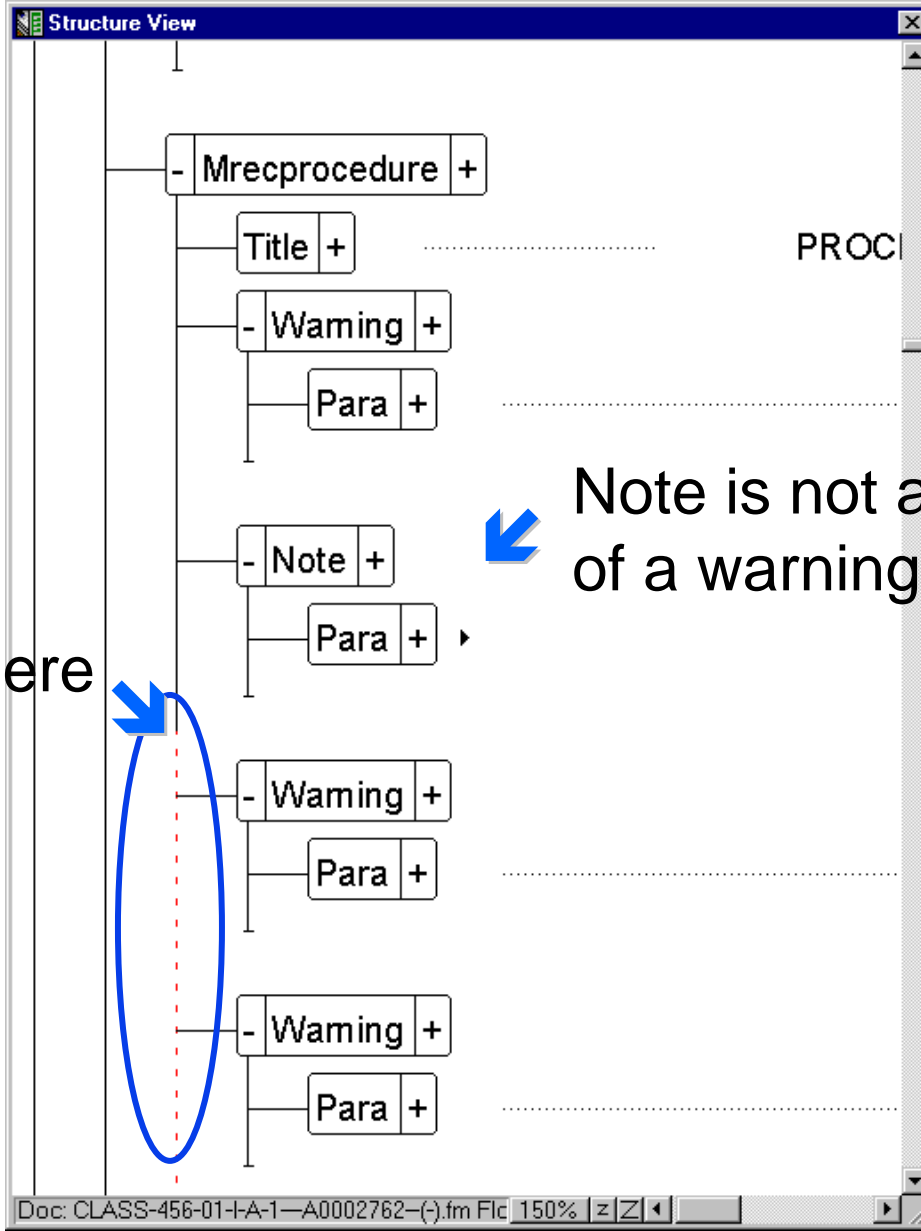
The Structure View on the right shows a hierarchical tree of the document's structure:

- Tasks +
 - Title + Task(s)
 - Para0 +
 - Title + 1. Obtain
 - Warning +
 - Para + Warning:
 - Warning +
 - Para + Warning:
 - Note +
 - Para + Note: En
 - Subpara1 +
 - Para + a. Open
 - Subpara1 +
 - Para + b. Drain

The status bar at the bottom indicates: Flow: A E: Para0 | 3 of 4* | 80%



Structure view with an error



Note is not allowed in front of a warning

Broken here



Tenix's ANZAC measured improvements with SIM/TeraText

- ◆ **Tenix's Ship 05 delivery challenge**
 - Client difficulties feeding flat files into AMPS
 - Documentation configuration management issues
 - Client 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**
 - 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** (See [Hall 2001](#))



References

- ◆ Westralia tragedy - <http://www.navy.gov.au/fleet/O195westralia/boi/report.htm>
- ◆ Longford gas plant - http://www.qmc.com.au/docs/conferences/QMC_2000/conf_clarke.pdf;
http://www.dnv.com/dnvframework/forum/articles/forum_2000_02_12.htm;
<http://www.ourcivilisation.com/decline/gasbang.htm>; http://www.ema.gov.au/5virtuallibrary/pdfs/vol15no3/Technical_expertise_as_a_contributing_factor_in_three_disasters.pdf

TENIX DEFENCE



A technology architecture for managing explicit knowledge over the entire lifecycle of large and complex projects

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20 November, 2002)

Part 3



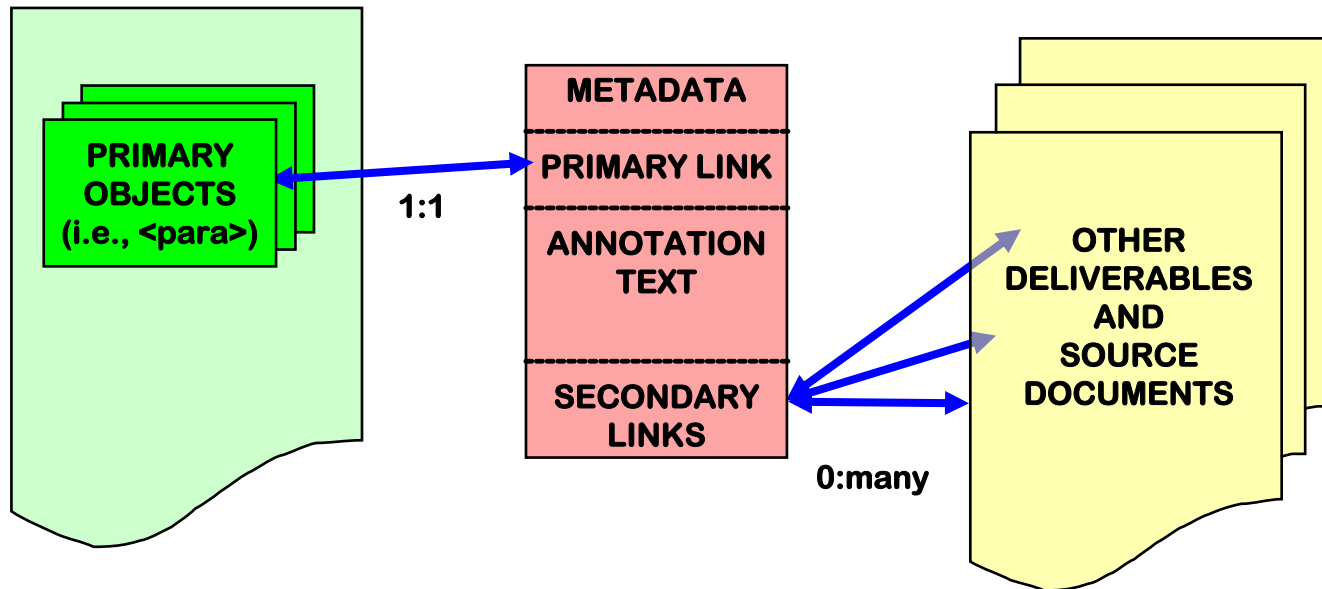
Extending Web technology

Tenix™



Capturing contextual knowledge: Annotations

- ◆ **Annotation functions are the key to converting authors implicit contextual knowledge to codified explicit knowledge**
- ◆ **Links are 2-way**
 - Document authors' IP for future reference
 - Change management





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 side serviceable circlip. Ensure that the operation is smooth and secured with a serviceable circlip.
- d. 62c7ffd0-acc4-11d5-81fe-00508b04acd2 Raise the desk and there is no abnormal noise or feel.
- e. Lock the desk in normal position. Apply the procedure in APP.

Annotation may be added here

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

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

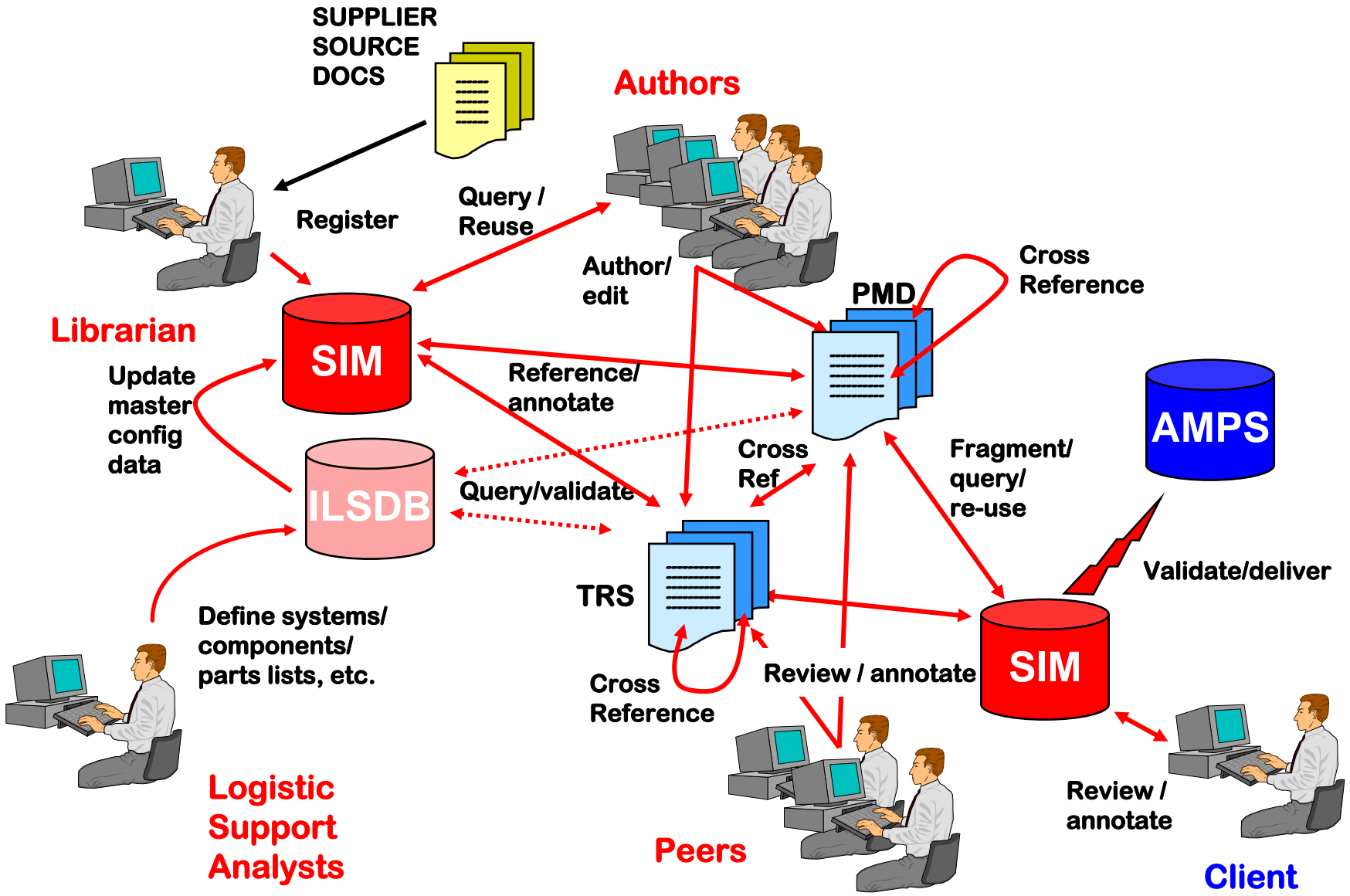
SOURCEREGISTRY Meta Data View

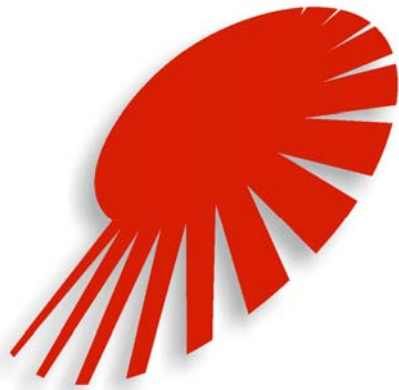
PubDocNo:	ABR 6187
TitleEtc:	Fan Group Switchboards for ANZAC Ships
Version:	0
Type:	PMD SGML Document Drafts - pre DVM version 2
FileFormat:	
SourceFileName:	TBA
Location:	ILS library
Remarks:	TBA
Author:	TBA
Publisher:	TBA
Sponsor:	TBA
SourceData:	No binary to Extract.

OK



Web authoring



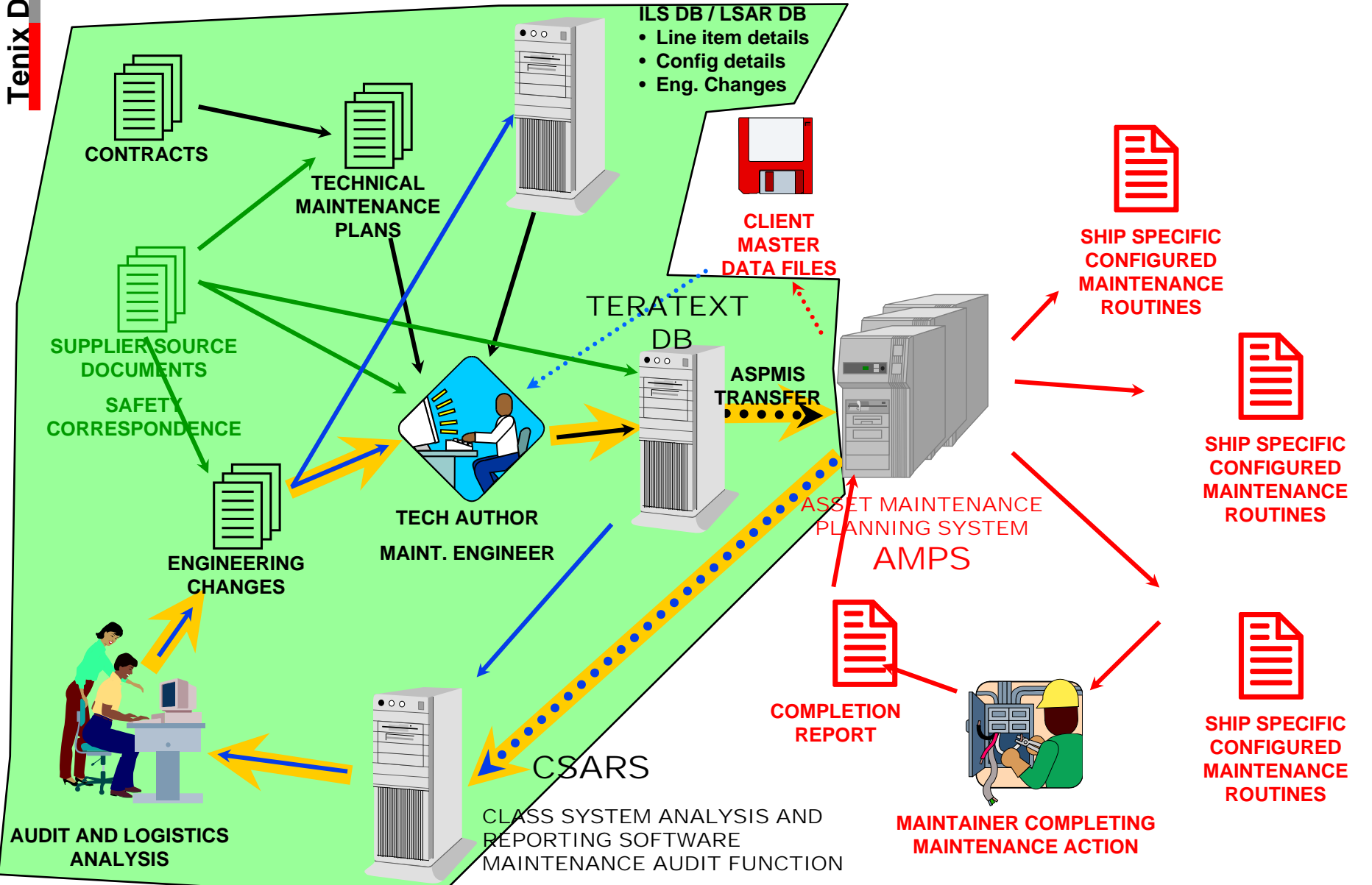


Tenix™

**Closing the circle with
operational knowledge**



Summary: How TENIX closes the circle





CSARS: Class Systems Analysis And Reporting Software

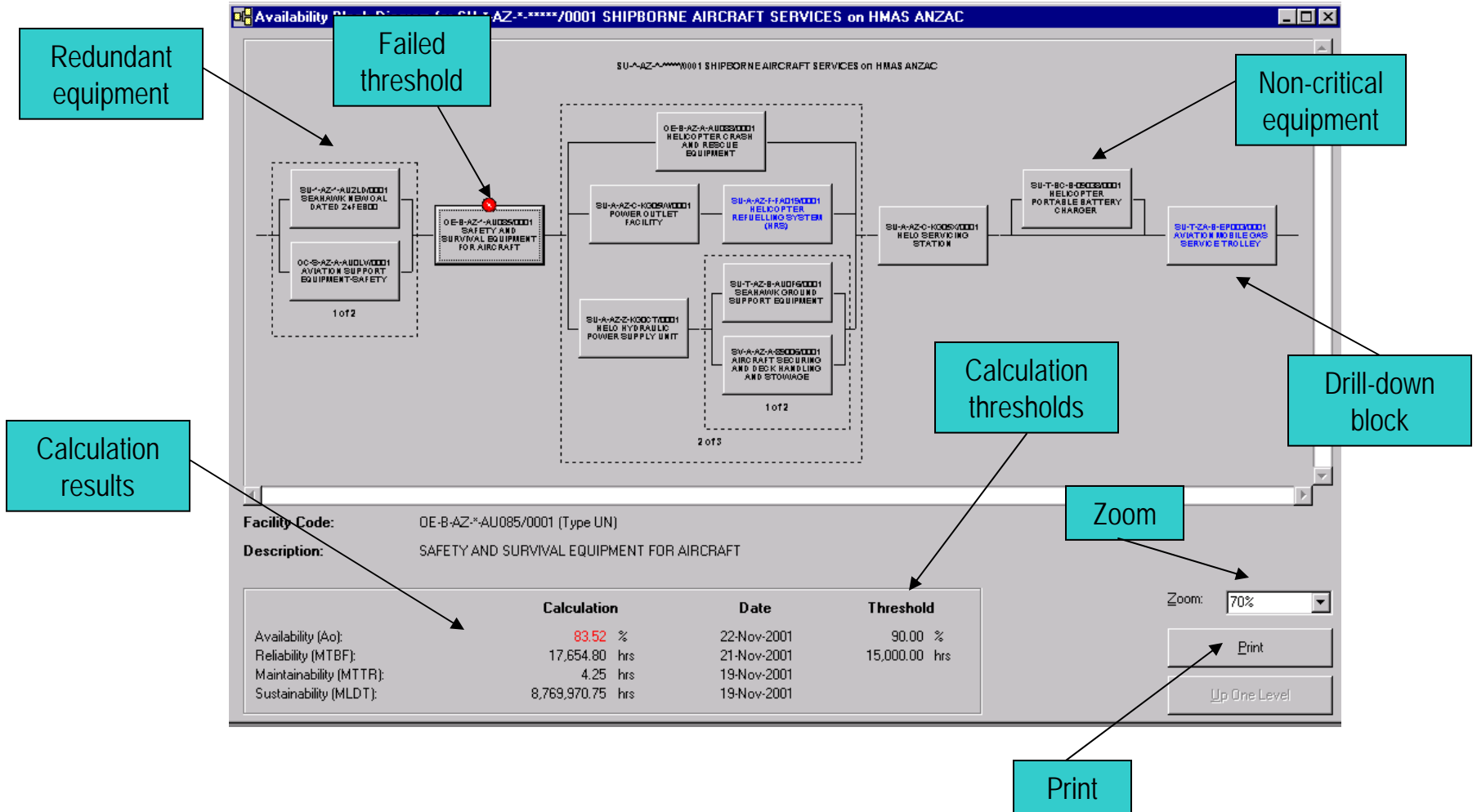
- ◆ **Tenix's TE&V role with OARRS**
 - Data collection completed 19 Oct 00
 - ILS TE&V completion Dec 01
- ◆ **Operators needed improved software tool for analysing 'actual' system & equipment performance**
- ◆ **Means of conducting:**
 - Reliability
 - Availability
 - Maintainability
 - Sustainability

} **RAMS** Analysis



CSARS: What does it look like?

Availability Block Diagram:





Measures for RAMS

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

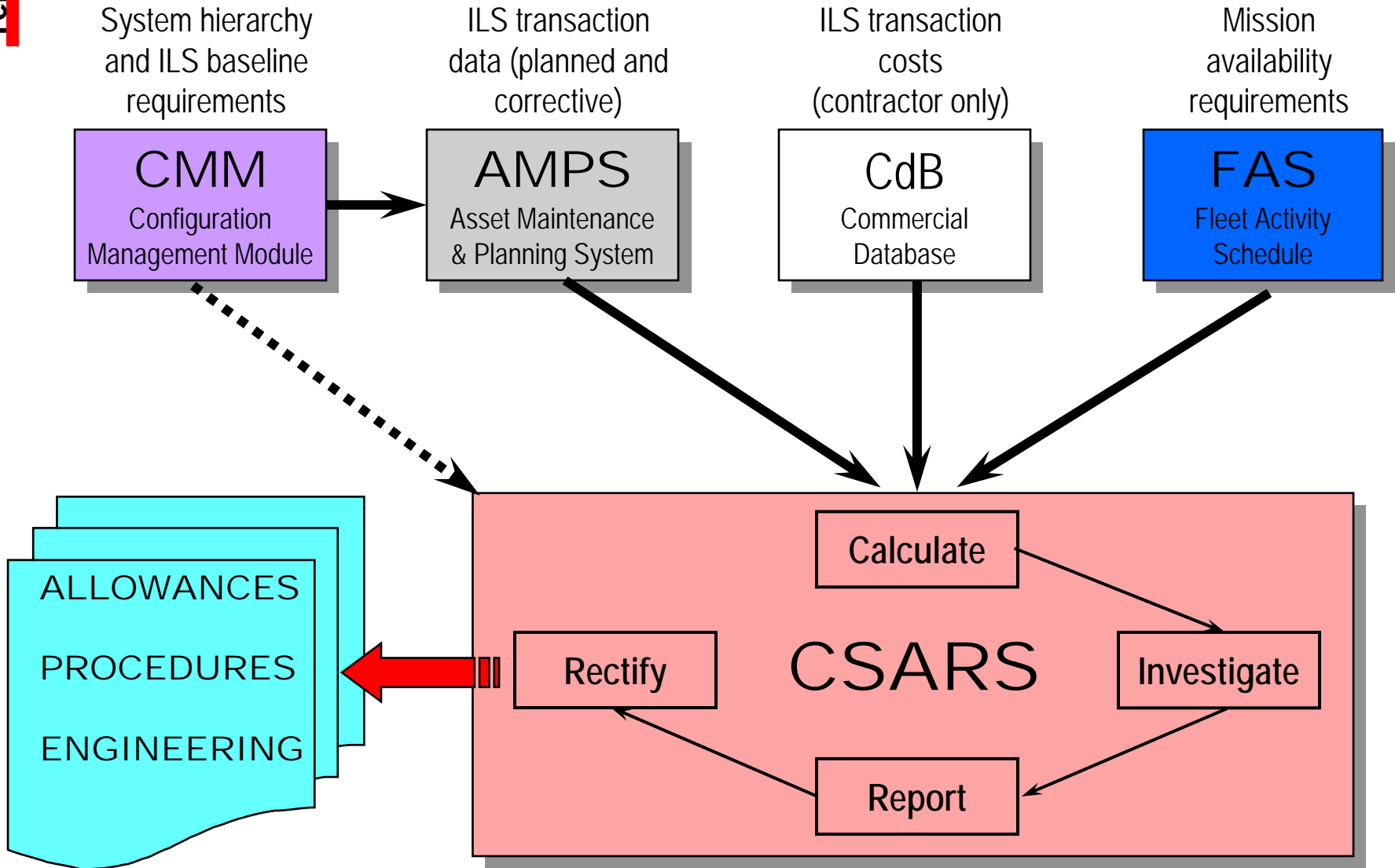


CSARS: What does it do?

- ◆ **Collects & validates operational data**
 - Retrieves downtimes, spares usage, corrective maintenance data from AMPS
 - Validates data
- ◆ **Calculates**
 - Performs RAMS calculations
 - Reports RAMS results
- ◆ **Analyses**
 - Allows ad-hoc system analysis
 - Isolates deficient equipment within system
 - Shows cause of equipment deficiency



Where CSARS fits

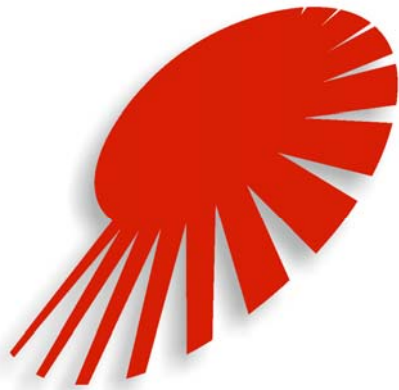




Where does CSARS help?

- ◆ **Informed Decision Making**
 - Determine existing capability
 - Prioritise tasks for maintenance
 - Manage repairables and materiel support
 - Determine effectiveness of support
 - Analyse costs

- ◆ **Continuous Improvement**
 - Data collection and reporting mechanisms
 - O, I & D level planned maintenance
 - Financial Forecasting
 - Estimating required inventory for “Surge” Capacity

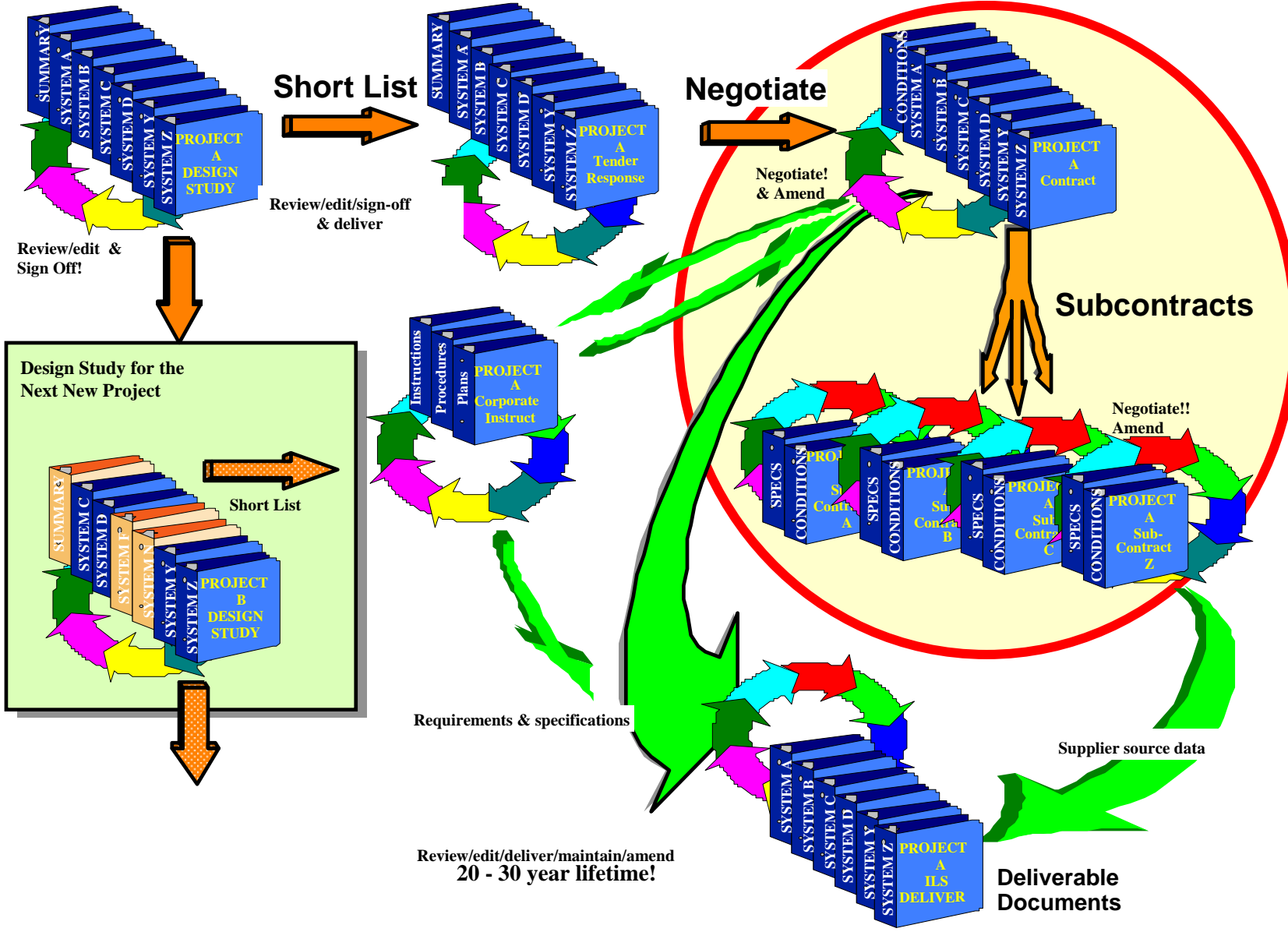


Tenix™

**Intranet KM tools in the front
end of the business cycle**



Simplified doco cycle for a large project





The central role for contracts

- ◆ **Client's RFT states capability requirements**
- ◆ **Bids/tenders**
 - Suppliers' proposals
 - Many bids to win one contract
- ◆ **Complex projects require a "virtual enterprise"**
 - Primes flow down obligations and requirements
 - Flowdown negotiations bigger than Client negotiation
- ◆ **Contracts are the agreed legal interfaces**
- ◆ **Tendering and contract admin costs are a significant part of overall project acquisition**
 - Costs subtracted from capability budget



Contracts as a knowledge mgmt interface

- ◆ **Client requirements for a product should be distilled into content of a contract**
- ◆ **Most supplier activities relate back to satisfying the contractually specified requirements**
- ◆ **Essential management systems on both sides need to be tied into the interface**
- ◆ **Requirements for the interface**
 - **Correct**
 - **Available**
 - **Useable**
 - ***Faster***
 - ***Better***
 - ***Cheaper***



Known Department of Defence issues

◆ Australian National Audit Office Reports

- Jindalee Operational Radar Network Audit Report No.28, 18/06/1996 - <http://www.anao.gov.au/WebSite.nsf/Publications/4A256AE90015F69B4A25690A002479D2>
- New Submarine Project Audit Report No.34, tabled 24/03/1998 - <http://www.anao.gov.au/Web/wsPub.nsf/AuditReportByTheme/5DE86D19FAEF672A4A2569060003FAC7>
- Management of Major Equipment Acquisition Projects Audit Report No.13, 11/10/1999 - <http://www.anao.gov.au/WebSite.nsf/Publications/4A256AE90015F69B4A256900000D4D46>
- Amphibious Transport Ship Project Audit Report No.8, 07/09/2000 - <http://www.anao.gov.au/WebSite.nsf/Publications/4A256AE90015F69BCA25695D008091FC>

◆ McIntosh/Prescott Collins Class Sub report

- <http://www.minister.defence.gov.au/1999/collins.html>

◆ Defence Efficiency Reform Program

◆ Australian Defence and Industry Strategic Policy Statement (1998)

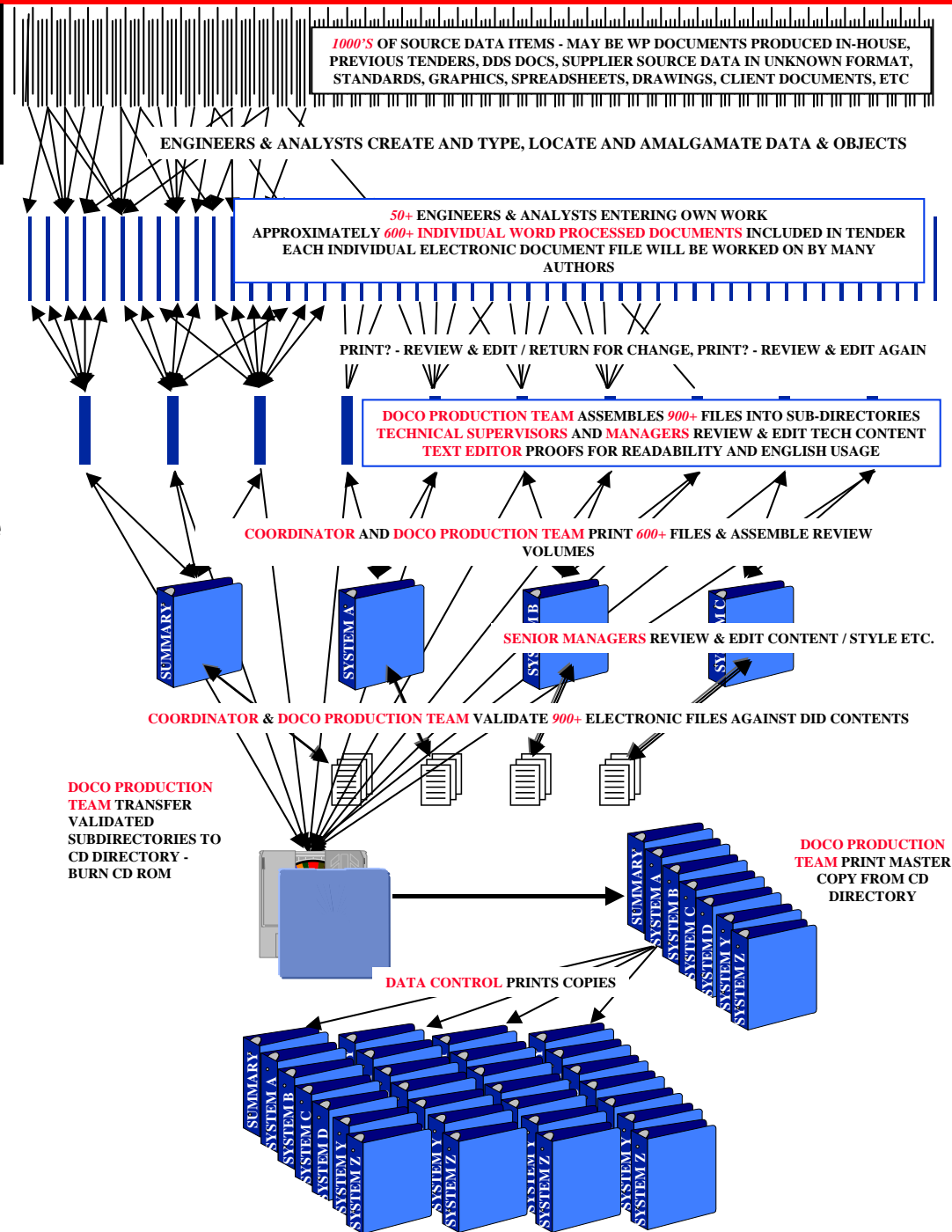
◆ DAO → DMO Reorganisation



Prime contractor production/mgmt issues

- ◆ **Effective contract management critical to business**
- ◆ **Prime contractor multiplies all process inefficiencies many times over!**
 - Customer presents ideas, supplier must offer solutions
 - Tenders won must pay for all lost tenders ($\times 10$)
 - One contract flows down to many subcontracts ($\times 100$)
 - Comparatively unskilled authors ($\times 2$)
- ◆ **Client pays for all suppliers' inefficiencies!**

Streamline bidding documentation funnel



- ◆ **Huge task**
 - Uses production resources
 - Don't reinvent knowledge
- ◆ **Conflicting views of time**
 - Supplier: crushing deadline
 - Client: inordinate delay
- ◆ **Word processing friction**
 - multiplies task magnitude
 - wastes resources & time
 - major source of delay
- ◆ **Delay generates crisis**
 - disorientation
 - panic
 - error



Process improvement

- ◆ **Effective knowledge mgmt maximises efficiency**
- ◆ **Conceptual tools**
 - **Query and discovery**
 - **Structured/controlled authoring environment**
 - **Electronic routing**
 - **review**
 - **approval**
 - **tracking and reporting**
 - **Links to source data**
 - **Change management and tracking**
 - **Links to other business processes**
 - **requirements analysis**
 - **awareness**
 - **Establishment and reuse of precedents**



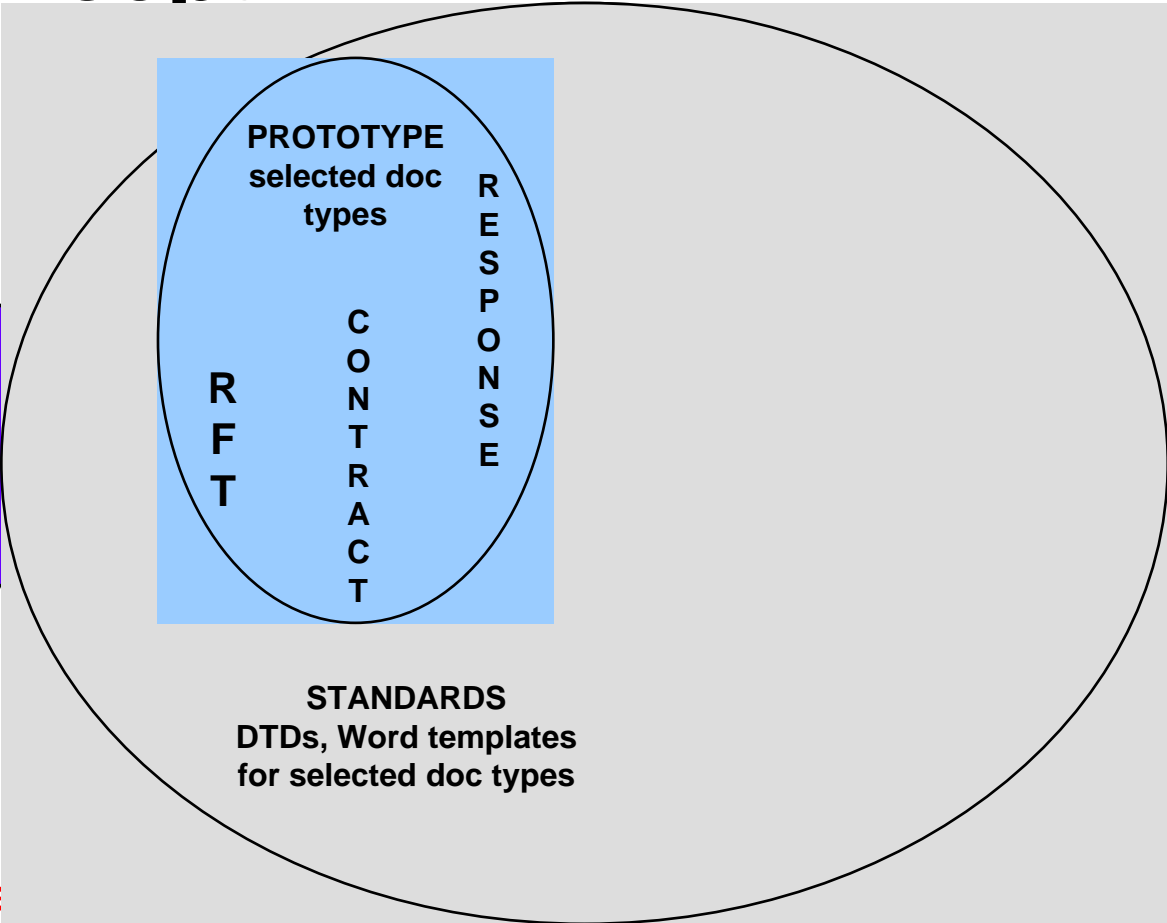
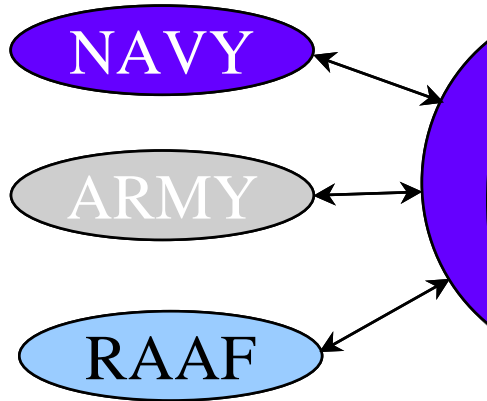
May 1998 Tenix/Defence Meeting in Canberra

- ◆ **Hoped to set non-proprietary standards for data exchange**
 - **Invigorate CALS and enforce compliance**
 - **Provide consistent project management infrastructure**
 - **Interchange standards for all stages of project lifecycle**
- ◆ **Two tiers of compliance**
 - **Lower level for small projects/suppliers**
 - **System of templates available for free via Web (Smart 2000)**
 - **Word processed documents produced under templates should be convertible to SGML (XML) by the large players**
 - **Higher level for primes and major projects**
 - **SGML (XML) interchange standards able to support content management applications**
- ◆ **Small players may exchange documents with any large player using the word processing standard. Large players should have the capacity to readily convert between the word processed format and the corresponding format under DTD control.**
- ◆ **Killed by Defence Efficiency Reform and staff rotations**



Structural concept

CLIENT REQUIREMENTS



Everything derives from or relates to the contract



SpeedLegal Pty Ltd

- ◆ Independent legal software developer, Queen St., Melbourne: <http://www.speedlegal.com>
- ◆ Significant relationships
 - Legal XML Contracts WG
 - CCH Australia/Wolters Kluwer Pacific
- ◆ SmartPrecedent
 - XML based precedent management and intelligent authoring system
 - Round trip between XML and RTF
 - Based on a DTD for the structural hierarchy of contractual documents
- ◆ Tenix implementation