


**Information Systems Integration
and the role PLM has to play**

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High-Tech Services




Ian Maskell


- q PLM Solution Delivery Manager for Thales Services Division
 - q Through life management of PLM initiatives and Enterprise PLM Applications
- q Defence Project involvement
 - q Watchkeeper
 - q CVF
 - q GBAD
 - q FIST
- q Current implementation projects
 - q Thales Aerospace PDM replacement and OracleMFG ERP Interface
 - q Thales Air Defence PDM replacement and OracleMFG ERP Interface
 - q Shared Data Environment for Watchkeeper


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Agenda 


- ØPLM Definitions
- ØInformation islands
- ØDirection
- ØFocus on the Product
- ØEnterprise Information System functional overlaps
- ØIntegration/Interface approaches
- ØFundamental Principles of PLM & CM applied to Information System Integration
- ØThe Product Lifecycle
- ØIndustrys tendency to avoid Information System Integration
- ØEnterprise Application Integration Benefits
- ØEnd User awareness of data currency & status


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PLM – Product Lifecycle Management 

Product Lifecycle Management is a strategic business approach to maximise the effective management and reuse of Intellectual Capital – Knowledge, Information, Data, Process, History with a specific focus on the PRODUCT.

Product Lifecycle Management is a product focussed approach to developing and managing superior products faster and at a lower cost through their entire lifecycle.


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Audience 

How many in the audience have come across Enterprise PDM/PLM implementations of systems like:-

- MatrixOne**
- Windchill**
- TeamCenter Enterprise**
- Agile**
- EnoviaPM**

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Audience 

How many in the audience have come across Enterprise PDM/PLM implementations with Interfaces to any system **other** than ERP/MRP?


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Information islands

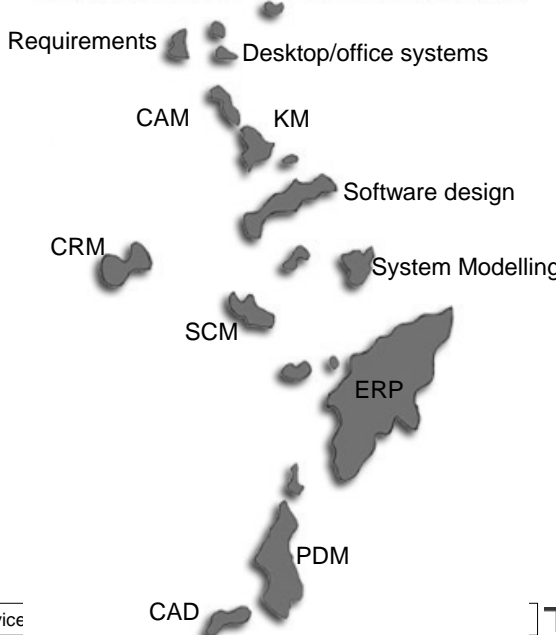
As progress was made to breakdown the barriers between information islands within Businesses operating departments, did Information Systems domain expertise start to fill the gap and play the same divisory role?


We have the technology, but we're not really delivering across the I.S domains are we?

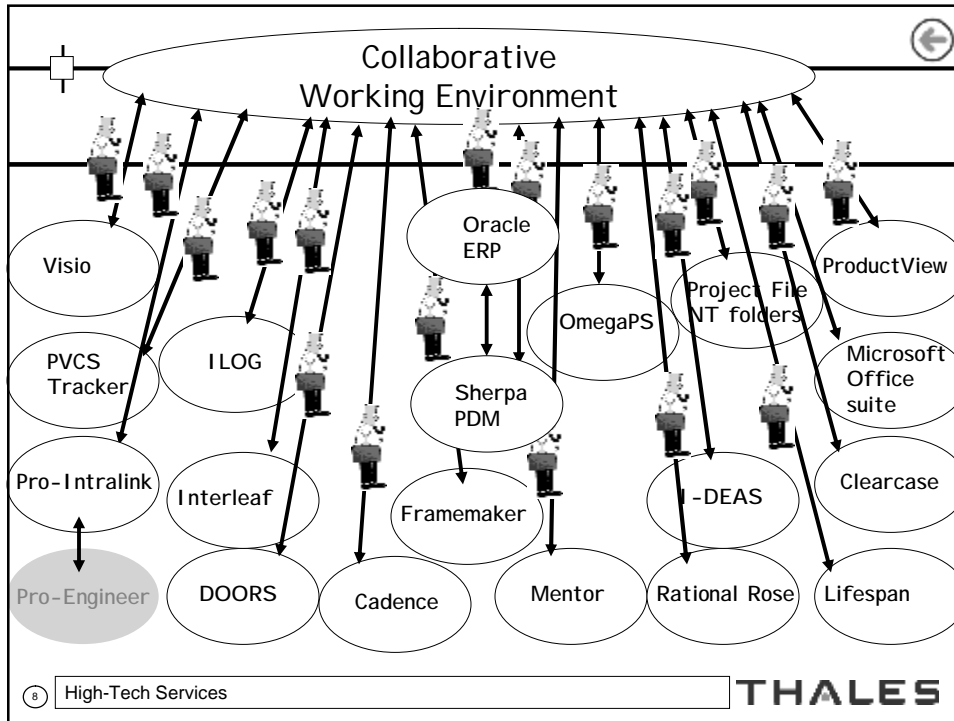
- n Desktop services
- n ERP
- n PLM
- n CRM
- n SCM
- n KM
- n CAM
- n CAD
- n CAE
- n Software design tools

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Lots of islands, but ferries always on the same route




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Dilberts talk different languages

- Pro-Engineer Dilbert talks FTP, STEP, IGES
- OmegaPS Dilbert talks DEF-STAN00-60, CDs and e-mail
- Mentor Dilbert talks Tapes and Hard Copy
- I-DEAS Dilbert talks hard copy
- C:O MRP Dilbert talks hard copy and faxes
- Sourcesafe Dilbert talks e-mail, CDs and FTP
- Some DOORS Dilberts talk HTTP with the customer


The text is presented in a list format within a slide titled 'Dilberts talk different languages'. The slide is branded with 'High-Tech Services' and 'THALES'.

Enterprise PLM systems value add 

Model the customer/supplier data delivery requirements into the workflow process

- q Supplier X is delivered STEP files on release of a CAD model
- q The ECAD design is published to the IBM QuickPlace collaboration environment for the PCB manufacturer
- q Invoke Export Control workflow review prior to any distribution overseas

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Direction 


q Businesses strive to improve based on many initiatives


- q CMMI
- q Configuration Management
- q UML
- q Prince2
- q Six Sigma
- q Kanban

q Has focus on the Business Product or Service diminished?

- q Put the Product First (courtesy of PTC)
- q Make Product Lifecycle Management drive your business

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Interfacing/Integrating Enterprise applications 




q Why do experienced professionals quake when this subject rears its head?


- q Oh – I've heard system X doesn't talk to system Y
- q Oh – I've heard vendor A doesn't like interfacing with vendors Bs applications
- q But what if vendor A upgrades the source application – when will vendor B support that upgrade
- q Err – those EAI tools are too expensive
- q Mmm – but a bespoke interface will be too costly to maintain won't it?


q SO WHAT!

- q What are your Business Drivers and what power of conviction do you have for those Business Drivers?

q **Stack them up against the risks, analyse then EXECUTE**

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Simple principles 



q Store once and reuse


- q How many times has this been presented – BUT it is the foundation of Configuration Management principles – one Assured source of the truth


q Fewer enterprise applications means fewer enterprise integrations/interfaces

- q Some organisations develop incredibly complex integration environments within which there is no awareness of data currency/staleness

q Fewer logical and physical repositories means lower overhead

- q Many organisations will store data in their Windows file structures and replicate in their Enterprise applications, with little visibility of the Master


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PLM toolset 

There is a family of 'Enterprise Product Lifecycle Management solutions' which can make a significant contribution to the PLM strategy, AND to Information Systems Integration.


'Domain PDM solutions' provide domain/workgroup focussed solutions which provide workstream contribution to the PLM strategy.

Authoring applications provide the granular origin, which we must reuse.

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PLM Strategy value add to Integration 

- Ø Facilitates distillation of the 'real' business requirements
 - Ø 'Desirable' only rules will be filtered out during Business rules modelling exercises
- Ø Provides a holistic full life view of the Product
 - Ø Provides full life metrics
 - Ø Project x had 500 changes through its life
 - Ø Our average designed part count per product is 50
 - Ø Most projects have a core of 10 people generating 90% of the data, but the whole of the rest of the company contributes the remaining 10%
 - Ø Fred is the only staff member who knows anything about Project x
 - Ø Helps to predict future project/product behaviour
 - Ø Helps to design out inadequacies in future products/projects
- Ø Single origin of information is reused
- Ø Reduces the number of interfaces
- Ø Standardises interfaces
- Ø Provides the main structured knowledge base as support for less structured databases such as those managed by KM tools

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PLM Solutions value add to Integration

- Ø Standards adoption
 - Ø PLCS compliance provides information persistency and begins to impart vendor/tool independence

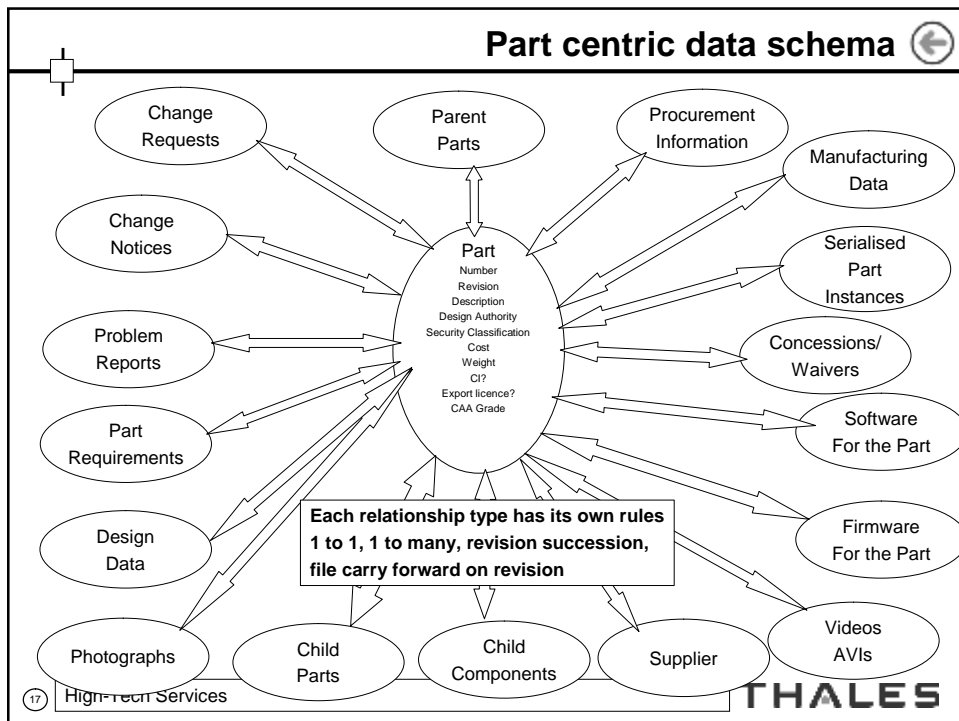
- Ø The Part centric data schema
 - Ø Provides the Part hub to which all can be associated
 - Ø Initiates and sustains the 'create once and reuse' strategy

- Ø Business rules modeller
 - Ø Defines how, when and what to share

- Ø Open APIs
 - Ø Simple/bespoke connectivity

- Ø Pre-configured interfacing modules
 - Ø Out of the box adoption of Industry best practice methods

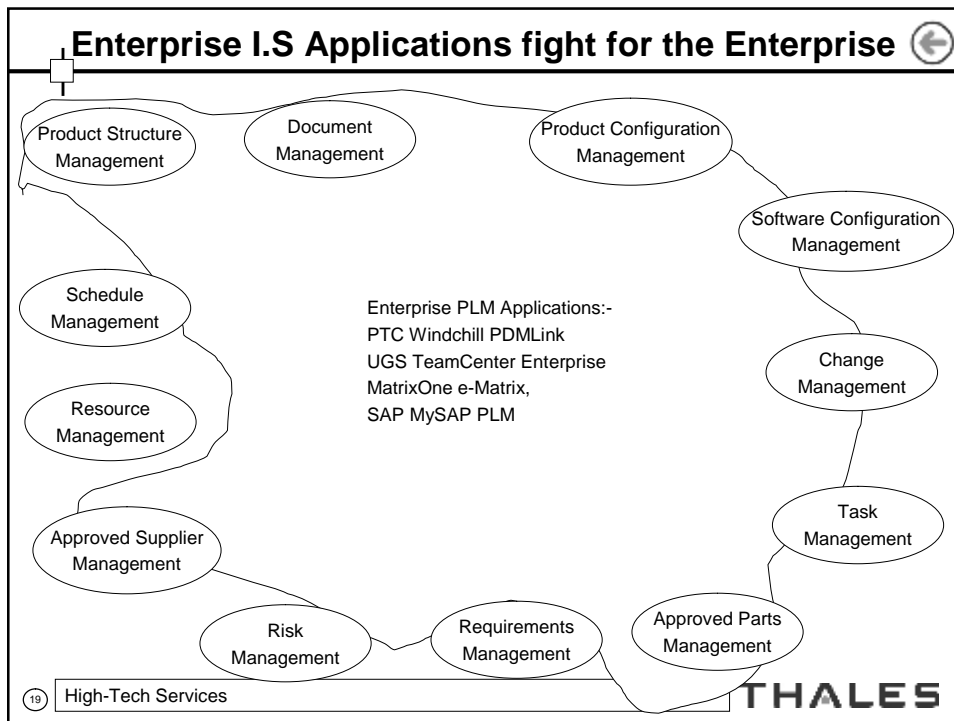
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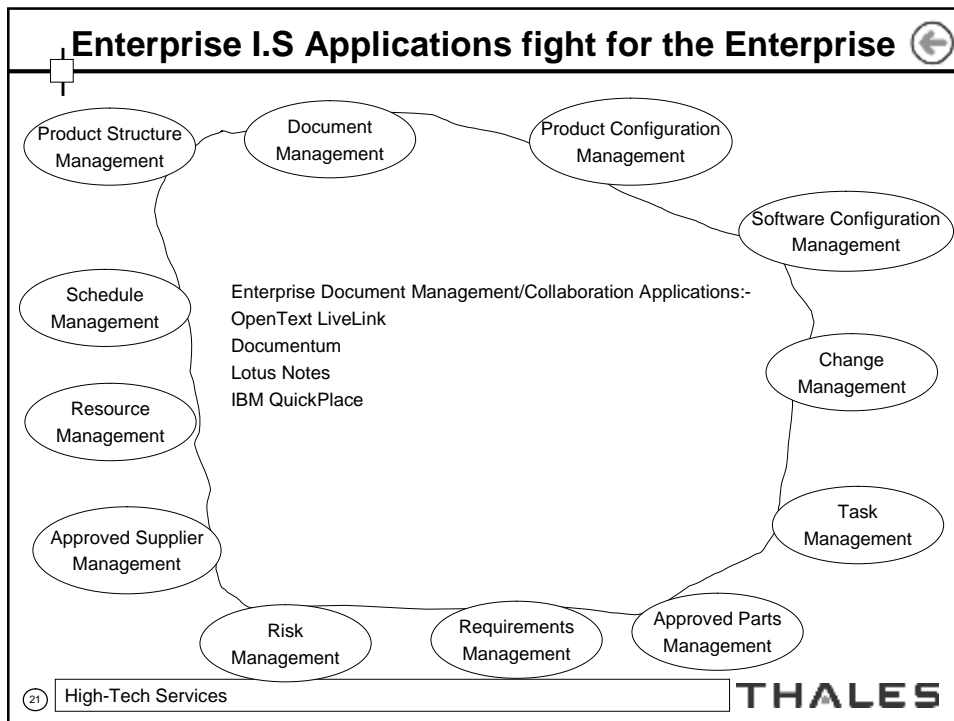
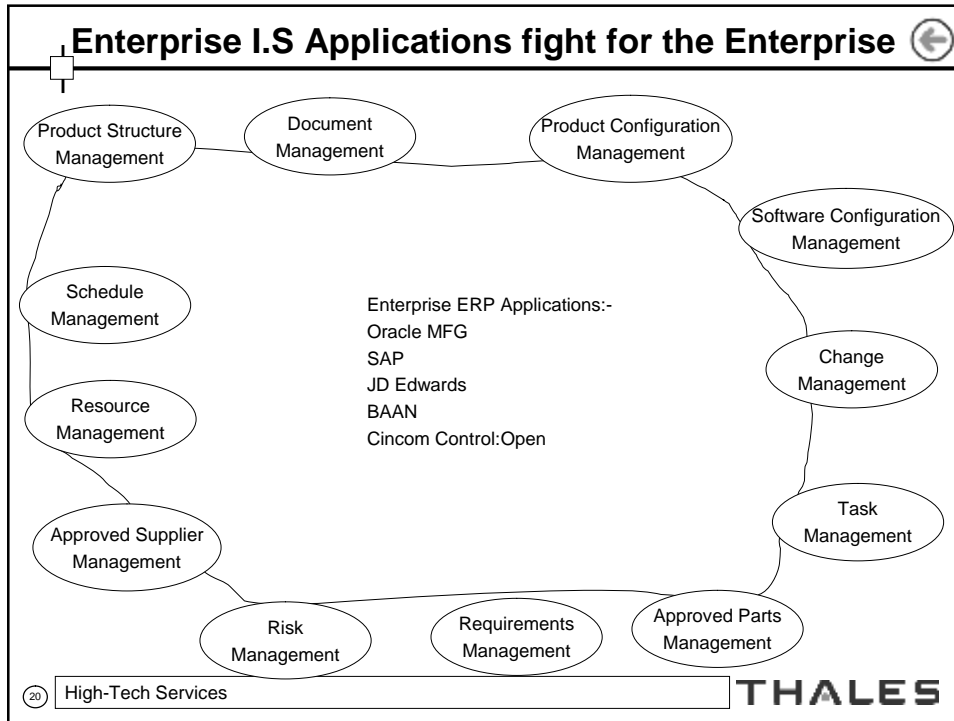


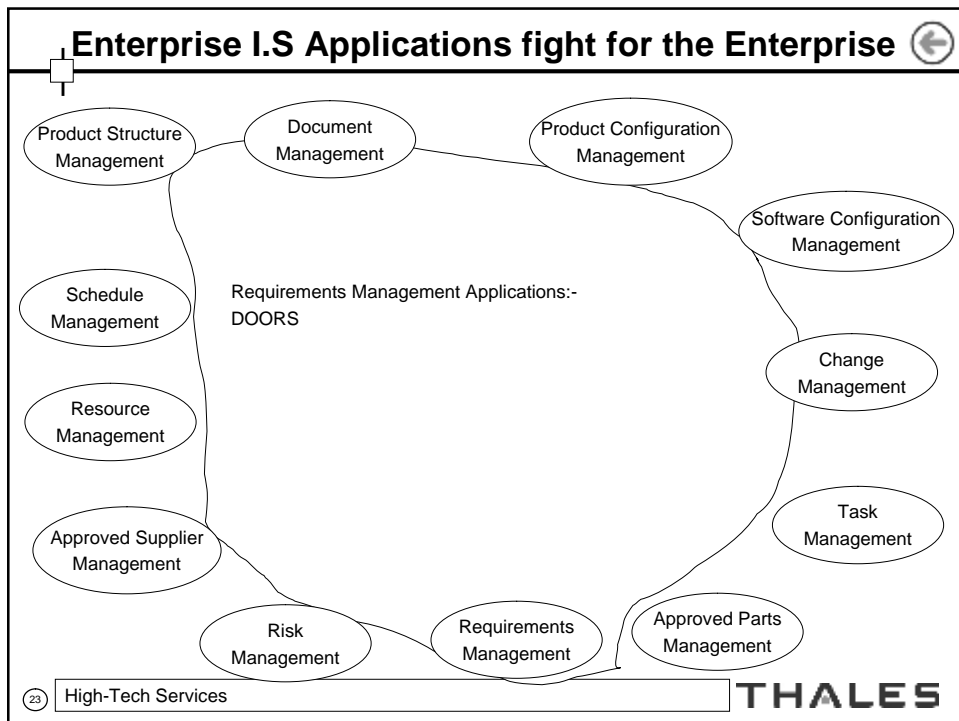
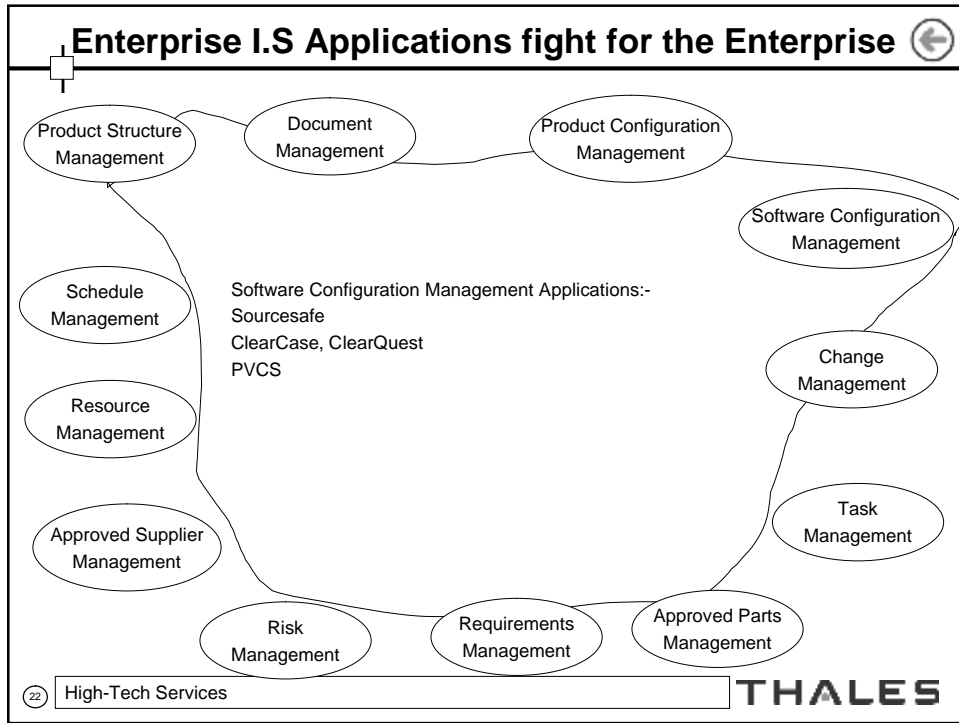
Enterprise Information systems functional overlap

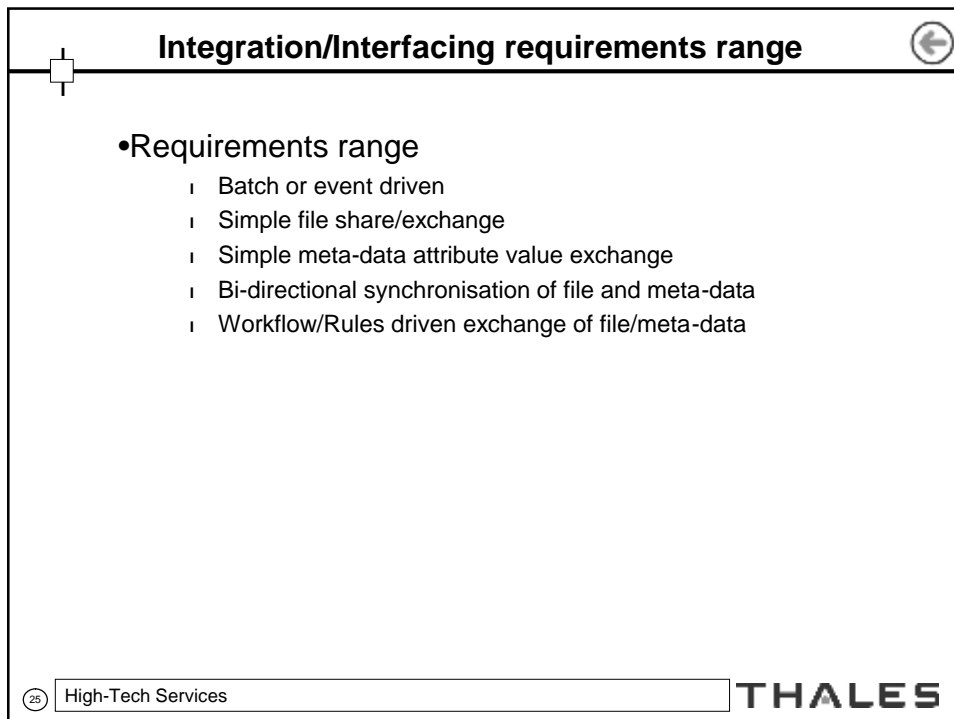
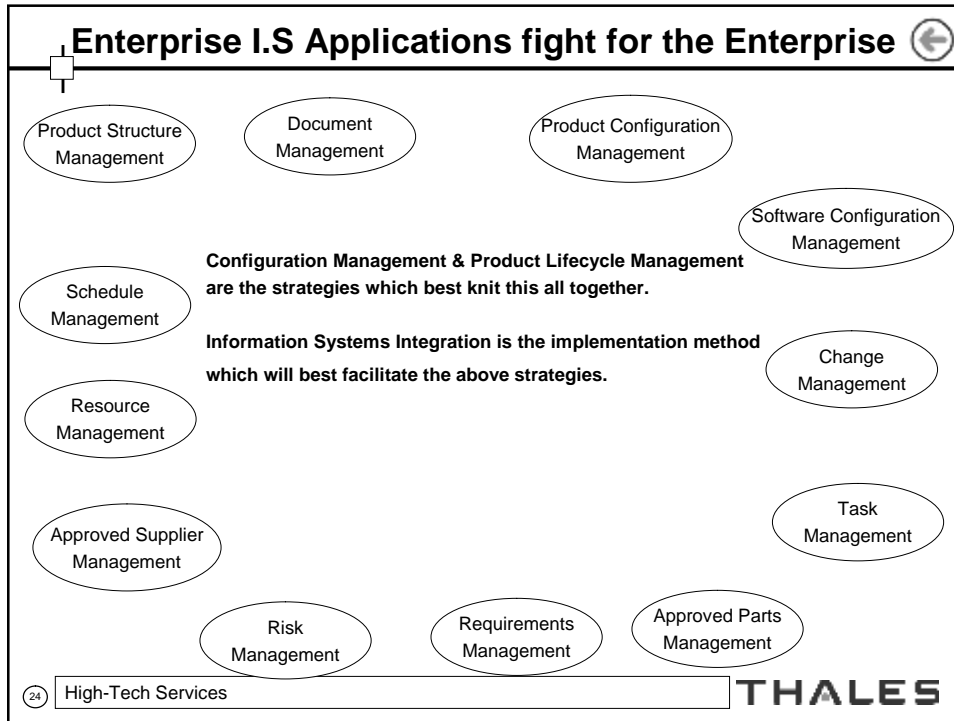
Information System Family	Functional capability						
	Document	Product Structure	Change Control	Requirements	Schedule	Resource	Task
ERP - SAP, BAAN, OracleMFG, JD Edwards	P	P	P	P	P	P	P
PLM - PTC Windchill, UGS TeamCenter, Matrixone	P	P	P	P	P	P	P
Document Management - OpenText LiveLink, Documentum	P	P	P	P	0	0	P
Requirements Management - DOORS, SLATE	P	P	P	P	0	0	0
Software Configuration Management - SourceSafe, ClearCase	P	P	P	P	0	0	0
Risk Management - Risk Decisions, Strategic Thoughts Active Risk Manager	0	0	P	0	0	0	0


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Integration/Interfacing solutions range 


- Ø Generic Enterprise Integration hubs like
 - o TIBCO

- Ø Domain specific hubs like
 - o CAD/PLM, ERP/PLM, Requirements/PLM
 - o UGS TeamCenter Integrator and various connector modules
 - o Oracle Integration environment and various connector modules
 - o PTC InfoEngine plus connectors
 - o SAP Integration tools and various connector modules

- Ø Generic Internet technology environments like
 - o Websphere
 - o Weblogic
 - o SUN Iplanet

- Ø Technologies like
 - o XML
 - o HTTP
 - o Bespoke comms protocols


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Open strategy greatly enhances Integration support 

- Vendors increasingly provide open APIs
 - n Often at multiple levels
 - n With persistency and deprecation information
 - ı E.g Warning - To be deprecated next release

- Many support contracts provide early warning of API deprecation
 - n E.g At least 2 major releases in advance

- Key to taking advantage of the above is to know the Business Critical APIs used, and to track them with the Vendor
 - n Make sure your Prime I.S Vendors know the hooks in their systems which are important to your Business

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Data sources during the lifecycle of a PART	
LIFECYCLE DOMAIN/PHASE	DATA SOURCES
Requirements	DOORS, Rational Rose, Specs in Document Management solutions like LiveLink or PLM system
Concept	CAD Models, CAD Sketches, Systems Engineering model (Rational Rose)
Mech Design	Pro-Engineer, CATIA, Unigraphics, Solidworks, Mech Desktop
Electronic Design	Mentor, CADENCE
Software Design	Clearcase, Clearquest, modelling tools
Number it	Excel spreadsheet, Access or Oracle database or PLM System
Describe it	Many design and office applications
Review	Company procedures, Modelled PLM Workflow
Change	Company procedures, PLM, ERP System, SW CM System
Release	Company procedures, PLM, ERP SW CM System
Manufacture/Procure	ERP (SAP, Baan, OracleMFG), Supply Chain Management SCM
Concessions/Production Permits	Bespoke, PLM, ERP Systems
Test and validate	Company Procedures, Document Management system, PLM System
Change	SW CM System, PLM
Deliver	ERP, Bespoke, Company Procedures
Maintain	Bespoke support system, occasionally ERP
Repair	Bespoke support system, occasionally ERP

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The lifecycle of a PART	
<ul style="list-style-type: none"> Requirements Concept Mech Design Electronic Design Software Design Number it Describe it Review Change Release Manufacture/Procure Concessions/Production Permits Test and validate Change Deliver Maintain Repair 	<p>PLM Value Add:-</p> <p>Concept/Design Optimise & enforce Order & rules of lifecycle events and processes - e.g Number it first for unique identification</p> <p>Support efficient exchange of all relevant, good quality information to facilitate collaboration</p> <p>Ensure the homogeneous view of the product and part to track, analyse and act on interdependencies, including change impact assessment</p> <p>Standardise lifecycle events – for example all Parts of this type undergo review type A</p> <p>Reduce duplication of effort – reuse data for example the CAD Model contains product structure information which can be used to populate ERP and PLM systems</p>

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The lifecycle of a PART



- Requirements
- Concept
- Mech Design
- Electronic Design
- Software Design
- Number it
- Describe it
- Review
- Change
- Release
- Manufacture/Procure
- Concessions/Production Permits
- Test and validate
- Change
- Deliver
- Maintain
- Repair

PLM Value Add:-

Review/release/change

Optimise Order and rules of lifecycle events and processes –
 e.g Peer review before major Business review,
 No outstanding design changes on initial release

Enforce CM standards for change control – e.g CMII/Fasttrack

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The lifecycle of a PART

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PLM Value Add:-

Manufacture/Procure

Optimise Order of lifecycle events and processes –
 e.g Ensure data required to drive ERP is present & authorised
 Provide Part data to the supplier in their required format

Provide visibility of changes throughout – Concessions, Permits,
 Waivers related to the Part

Manage the serialised Part instance (Order, BOM, Change)

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The lifecycle of a PART

- Requirements
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- Concessions/Production Permits
- Test and validate**
- Change
- Deliver
- Maintain
- Repair

PLM Value Add:-

Test and validate

Optimise Order of lifecycle events and processes –
e.g ensure capture of test results before signoff
Provide comparison of 'as designed' with 'as built' and 'as tested'

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The lifecycle of a PART

- Requirements
- Concept
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- Number it
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- Release
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- Change
- Deliver**
- Maintain
- Repair


PLM Value Add:-

Deliver

Optimise Order of lifecycle events and processes –
e.g obtain Q.A release before packaging.
Share 'as designed' with 'as built' e.g PLM/ERP Interface.
Ensure delivery documentation is produced according to
Company Standard.

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The lifecycle of a PART




- Requirements
- Concept
- Mech Design
- Electronic Design
- Software Design
- Number it
- Describe it
- Review
- Change
- Release
- Manufacture/Procure
- Concessions/Production Permits
- Test and validate
- Change
- Deliver
- Maintain
- Repair


PLM Value Add:-

Maintain and repair

Repair either to latest standard or to as delivered according to customer contract.
Provide comparison of 'as maintained' with 'as delivered' and New/latest 'as designed'.

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Interfacing/Integrating applications



q A common scenario


- q Business X has very good MCAD/ECAD implementations, and an enterprise PLM or ERP system
- q Has also invested in MCAD/ECAD integration tools and is reaping good benefit during the local ECAD/MCAD design phases
- q Common component library and rapid reuse are prime value areas


q Business prepares for manufacture/procurement release

- q CAD data is checked into the local CAD workgroup manager
- q Release process is executed
- q Enterprise PLM/ERP Input agent then manually copies much of the data generated by the CAD model, into the PLM/ERP system


q Ooops! Out come some design changes


- q Enterprise PLM/ERP Input agent then manually copies changed data generated by the CAD model, into the PLM/ERP system
- q Or just as frequently, the CAD model is not changed, and the changes are described in approved Change Requests/Change Notices

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Domain Applications 

- Domain PDMs
 - n Requirements
 - | DOORS, TeamCenter Requirements (SLATE)
 - n MCAD
 - | Pro-Engineer, Pro-Intralink, Pro-PDM, UnigraphicsNX, TeamCenter Engineering, CATIA
 - n ECAD
 - | Mentor Graphics
 - | CADENCE
 - n Software
 - | Clearcase, Lifespan, Sourcesafe
 - n Systems Engineering
 - | Rational Rose
 - | Other UML modellers
 - n Document Management (a catch-all)
 - | OpenText LiveLink
 - | Documentum, LotusNotes, QuickPlace,

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ECAD, MCAD, CAE as examples of PLM benefits 


All 3 CADx streams use the product geometry at their core
It's tempting to maintain segregation to avoid 'integration issues'
BUT
Look at the commonality:-

- ECAD – physical characteristics of the PCB, Profile, Layers, Components, Track, Track routing, Pins, Pin connectivity

- MCAD – physical characteristics of 'all other' Mechanical and Electro-Mechanical components, sub-assemblies and assemblies



Example 1
The PCB profile, external dimensions, interfaces are modelled in the ECAD system.
The MCAD system requires this information for its interfaces to motherboards and other PCBs, racks, mating connectors, cables.


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ECAD, MCAD, CAE as examples of PLM benefits 

Example 2
MCAD and ECAD systems almost always have a component library maintained within
Very few in Industry share this component library with Enterprise Business systems in any way
BUT
The CADx library is the first source for:-
Component Identification
Supplier Details
Manufacturer Details
Component geometry, function, specification

Enterprise systems such as ERP, MRP, PLM can make efficient use of much data contained within the CADx libraries.

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Example from Automotive powerplant supplier 

qA Major Commercial vehicle powerplant provider has a bespoke Oracle database developed application which spans 4 Enterprise Business Systems – ERP, PDM, Finance and Dealer, plus 6 more local domain systems.

- q** Primarily SQL level information share
- q** The system contains data which is refreshed at wildly differing rates, and which is not marked with currency.
- q** End users therefore have no idea whether they are working with latest or stale data.

qSimple application level re-use of a Design Product Structure in the above organisation saved 2 man days per Aftermarket Product Structure input to the dealer system

- q** Saving is 24 man days per year per Aftermarket product structure!
- q** Estimated 72 man days per year

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Data model ←

Generic, available to all	
Description	
Number	
Revision	
Format	
Author	
Owner	
Access rights	
Files	
Office	Open to all apps
Specific to interfacing app	
MCAD	MCAD app and Comp I/F
ECAD	ECAD app and Comp I/F
Datasheet	Open to all apps
Requirements objects	DOORS and DOORS I/F
Software	Sourcesafe/Clearcase
System	Rose/UML I/F

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Assembly aid website generated from PDM data ←


Video session window showing method of component assembly for assembly step 6.


Lightweight CAD model visualisation running in application window.

Links to wiring photos, PDM Bill Of Materials etc.

Links to process documents, 2d Assembly drawings, ERP routing information


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Final thought 




When implementing an Integrated environment with multiple interface points


- q** Make sure the user knows refresh rates and currency of data from the multiple systems
- q** Use indicators like created date, last update date, and refresh rate – and place them ‘in the users face.

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Make PLM Drive Your Business 



Put your Product First (courtesy of PTC)

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