IBM

Asset Lifecycle Management Solution for Chemicals and Petroleum

IBM PLM Solutions
2003

I. Industry POV

Asset Lifecycle Management - PLM for C&P

OPERATING PLANTS

Plant Asset Operations, Monitoring and Maintenance Processes$10-trillion asset value of equipment & systems installed WW.

$250B/year operating budget($5B I/T spend)

NEW ASSETS & EQUIPMENT

Asset Manufacturing
Plant Equipment & Systems Design, Fabrication and Commissioning for new plants and for Re-tooling existing$1-trillion added asset value / yr WW.

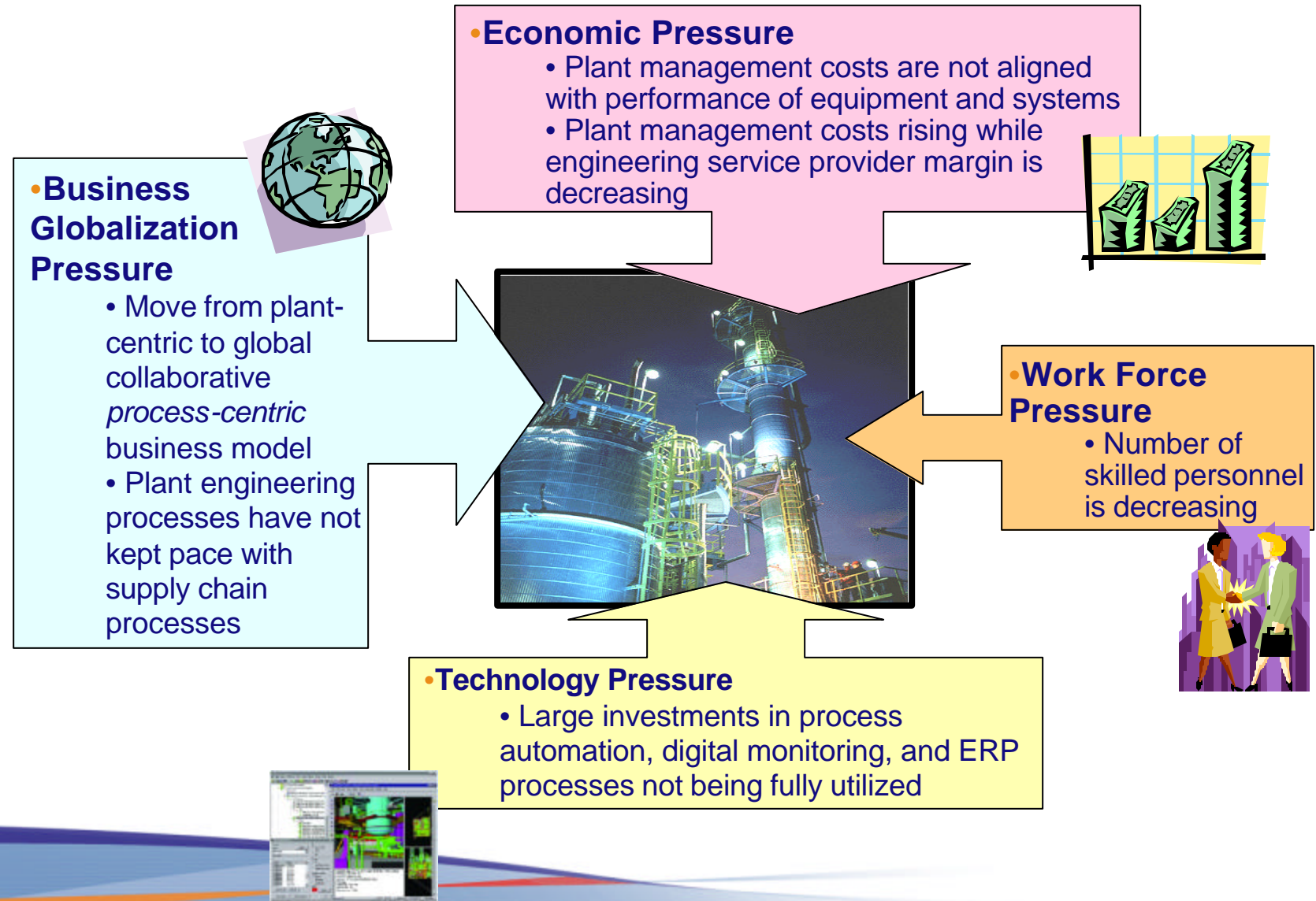**$300B/year capital expenditure budget($1B I/T spend)**

PLANT   DESIGN & CONSTRUCTION

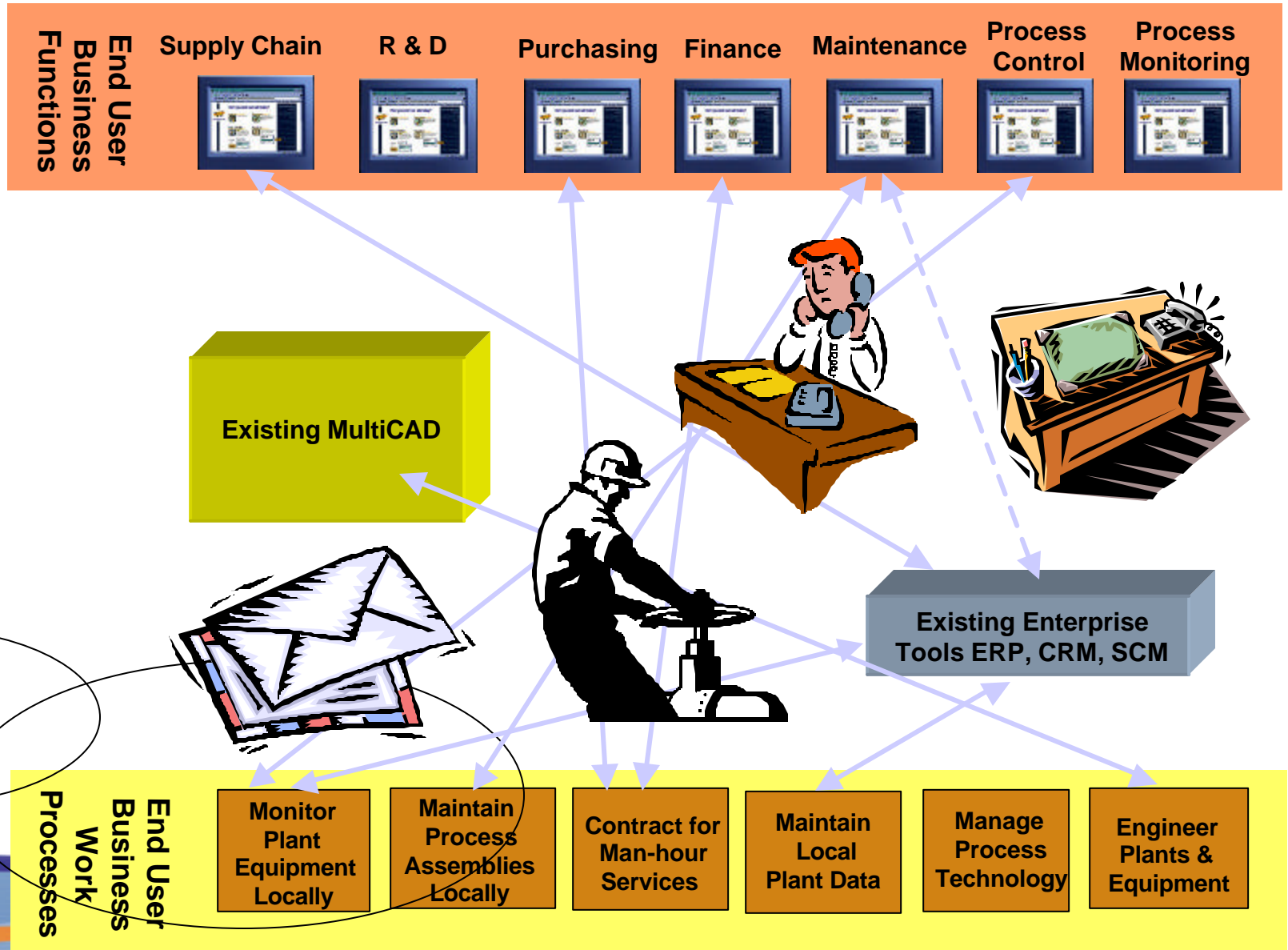**New Plants and Modifications of existing Plants.$500M I/T spend.**
$500M I/T spend

Over 90% of the total Plant Business
Equipment & Systems Lifecycle Management Business

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Motivation: Business Drivers

•Economic Pressure
- Plant management costs are not aligned with performance of equipment and systems
- Plant management costs rising while engineering service provider margin is decreasing

•Business Globalization Pressure
- Move from plant-centric to global collaborative *process-centric* business model
- Plant engineering processes have not kept pace with supply chain processes

•Work Force Pressure
- Number of skilled personnel is decreasing

•Technology Pressure
- Large investments in process automation, digital monitoring, and ERP processes not being fully utilized
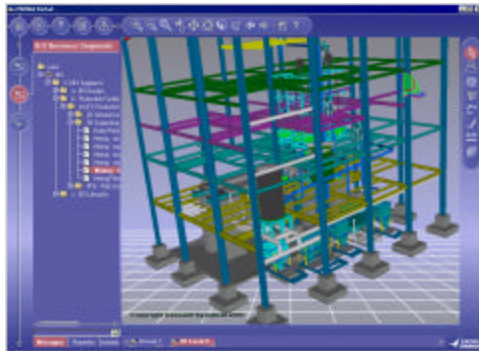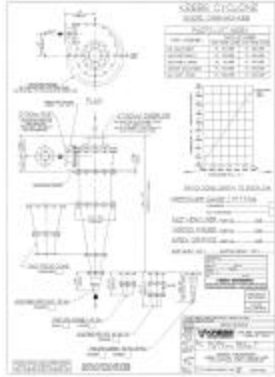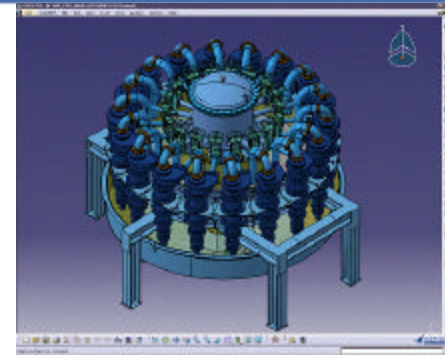
Current Business Misalignment
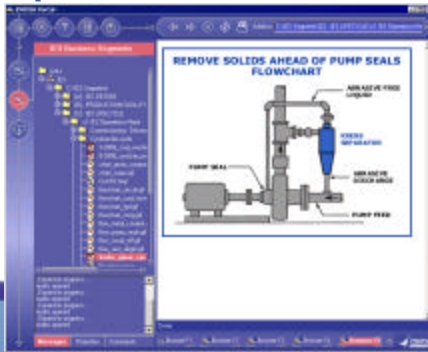
C&P Value Chain

**Equipment Supplier
(EQS)**

*Equipment
Supplier*

EQS- EPC

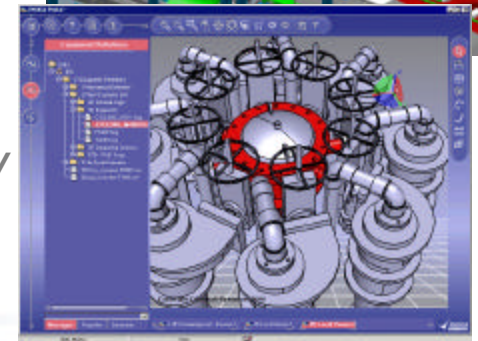*O/O – Equipment
supplier*

**Engineering Procurement &
Construction
(EPC)**

Owner & Operator(O/O)

*EPC – Owner/
Operator*

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Top 3 Pains – Chemical and Petroleum Industry

- Owner operator *asset utilization* is stagnant or diminishing since there is pervasive inability to leverage "know-how" in operations and maintenance work processes
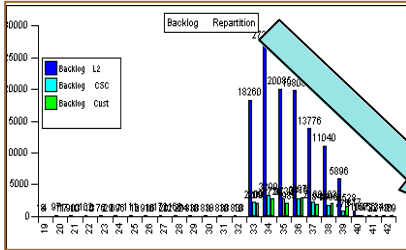
- Production unit costs are rising with more stringent *environmental and safety regulations* and not taking advantage of global economies of scale

Process expertise and "know-how" is diminishing due to retirement and staff reduction

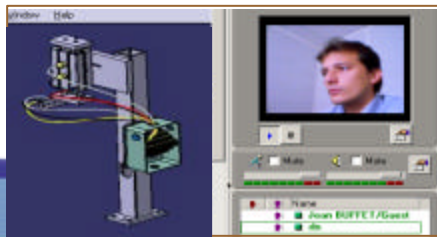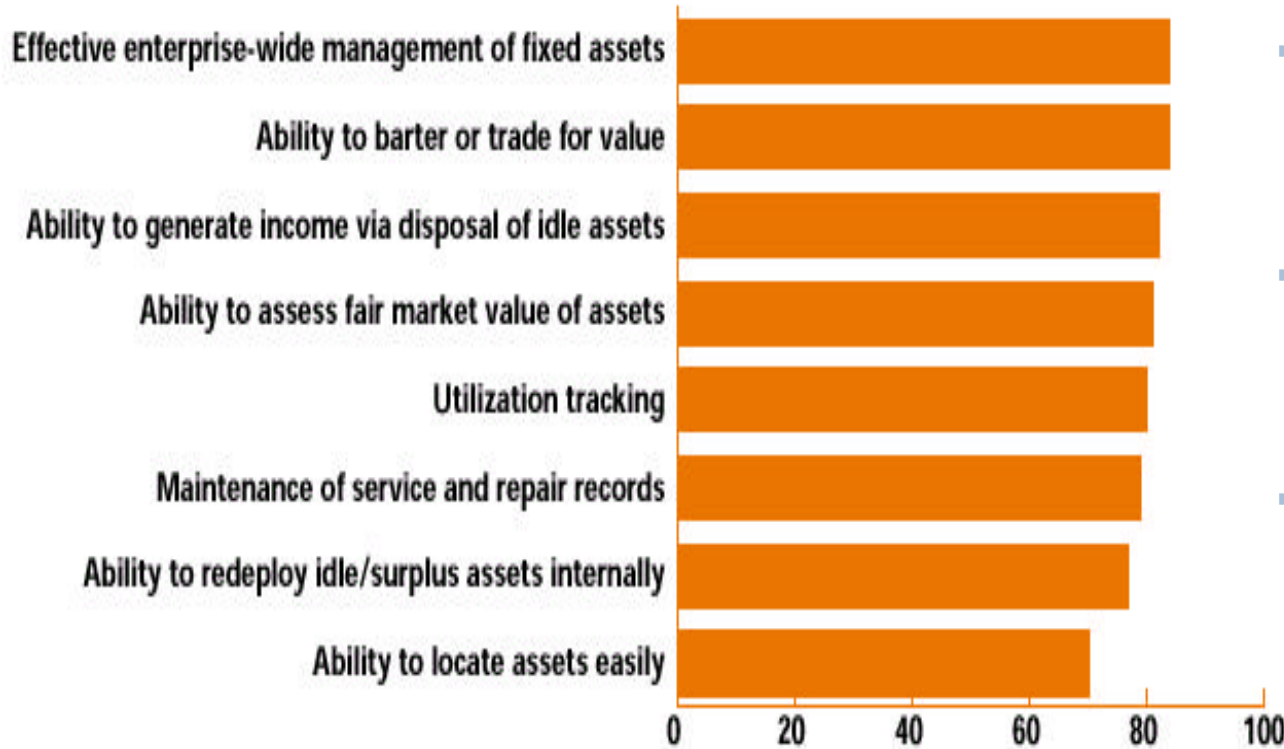# CFO Objectives by CFO.com

CFOs' Areas of Greatest Concern: % Dissatisfied with their firm's performance

Effective enterprise-wide management of fixed assets

Ability to barter or trade for value

Ability to generate income via disposal of idle assets

Ability to assess fair market value of assets

Utilization tracking

Maintenance of service and repair records

Ability to redeploy idle/surplus assets internally

Ability to locate assets easily

0   20   40   60   80   100

CFO Enterprises Research Services Group

- Costs are not directly linked to asset performance or reliability

- Reusable know-how is not incorporated into business work processes

- Assets are too expensive in fulfilling requirements of performance, reliability, and safety

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Industry Specific Issues: C&P

Decision-makers are asked: "Are you investing IT dollars in...."

	% Investing GMB	% Investing 1,000+
CHEMICALS & PETROLEUM ISSUES		
Business process integration within your enterprise	47%	60%
Integrating your manufacturing operations to your enterprise-wide systems	33%	48%*
Integrating business processes between you and your trading partners	23%	39%*
Product life cycle management or asset life cycle management	13%	24%*
Improving petroleum retail operations	13%	19%

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Collaboration and Integration are top of mind issues that are driving the formulation of IBM's ALM solutions

- Target Audience

  VP of Production Operations,

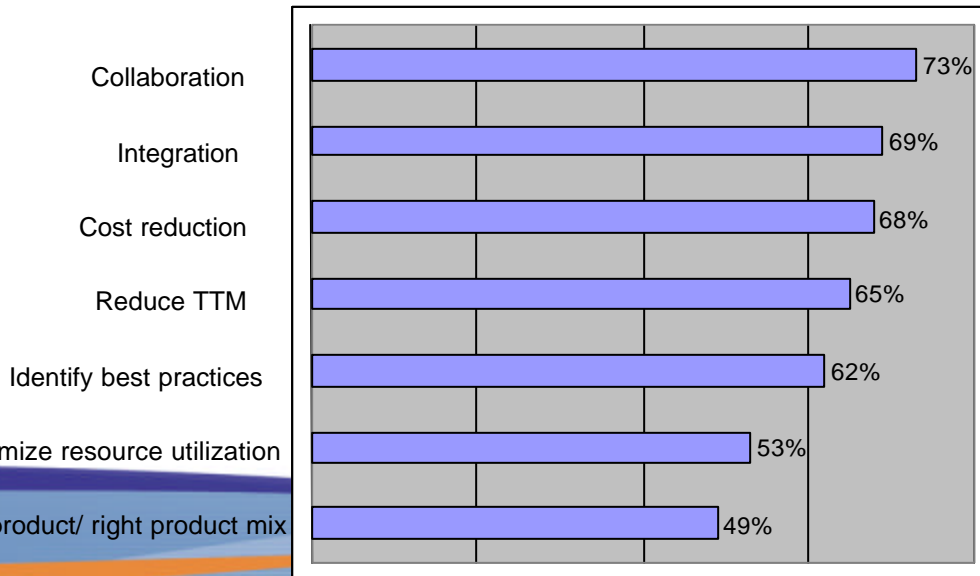 **LOB Execs, VP Engineering, VP Global Projects)**

- Customer Pain Points

  Economic Pressure - Utilization

  Work Force Pressure - "Big Crew Change"

  Business Globalization Pressure - Regulatory Compliance

  Technology Pressure - Hand-off Issues

| Category	Percentage
Collaboration	73%
Integration	69%
Cost reduction	68%
Reduce TTM	65%
Identify best practices	62%
Optimize resource utilization	53%
Right product/ right product mix	49%

- Customers believe that collaborating in real time with customers and suppliers will be critical the their success

- Companies want to find ways to better integrate their asset lifecycle management solutions with other enterprise processes and applications

- Reducing design and operational costs and time to market is also a primary concern

IBM as the Leading Integration Vendor

The Application Integration Vendor 2Q02 Magic Quadrant

Source: Gartner Research
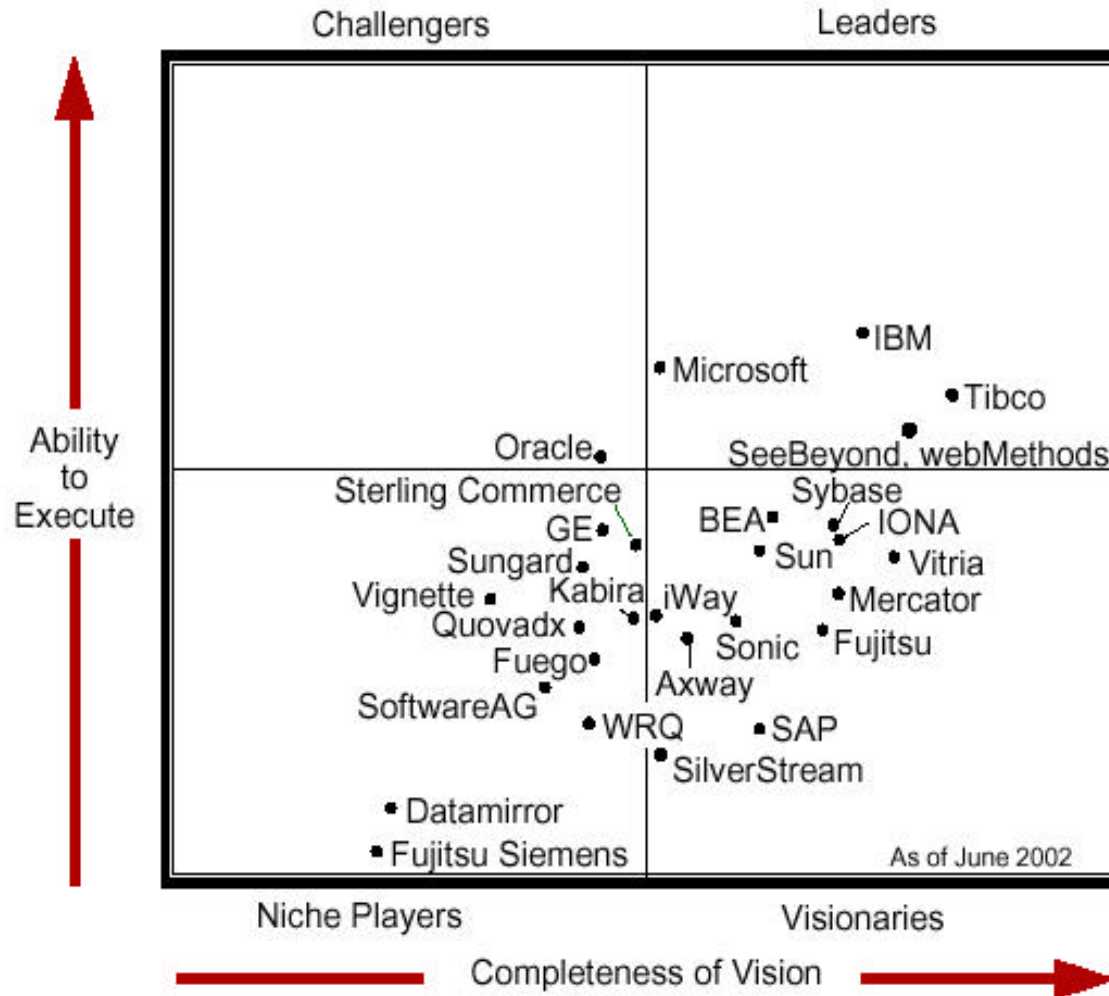
II. C&P PLM Process & Performance

ALM involves complex extended-enterprise business processes and data management requirements

Finance / R&D **Conceptual Design** **Process Engineering** **Detailed Engineering** **Construction & Start-up** **Operations & Asset Mgt** **Retirement**

Strategic Planning

Simulation & Process Design

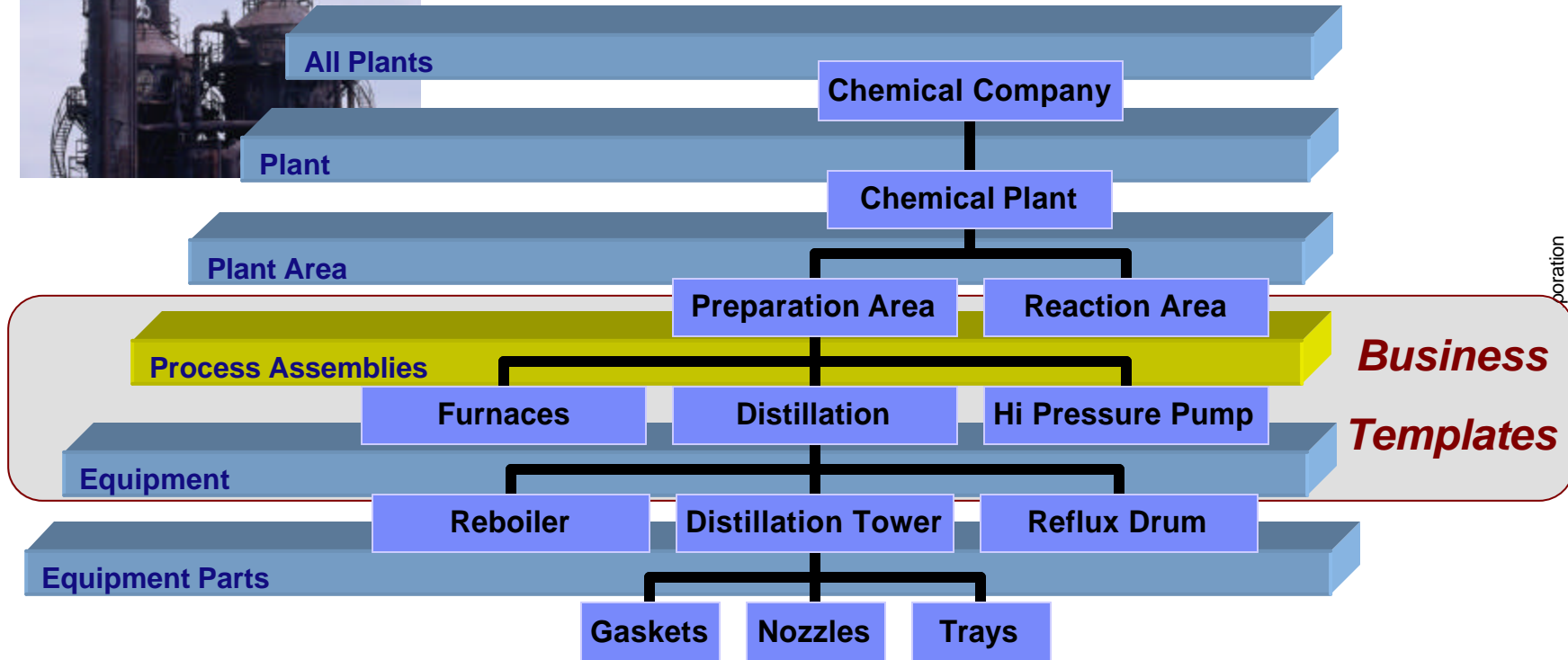Project Management

SRM & Strategic Sourcing

CAD/CAE

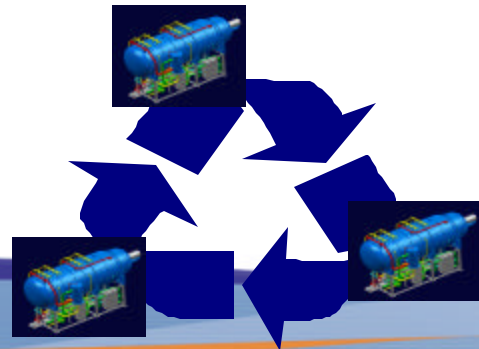Knowledge Management and Asset Data Management

Supplier Collaboration

ERP Integration

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What are Process Assembly Units?

All Plants

Chemical Company

Plant

Chemical Plant

Plant Area

Preparation Area

Reaction Area

Process Assemblies

Furnaces

Distillation

Hi Pressure Pump

Equipment

Reboiler

Distillation Tower

Reflux Drum

Equipment Parts

Gaskets

Nozzles

Trays

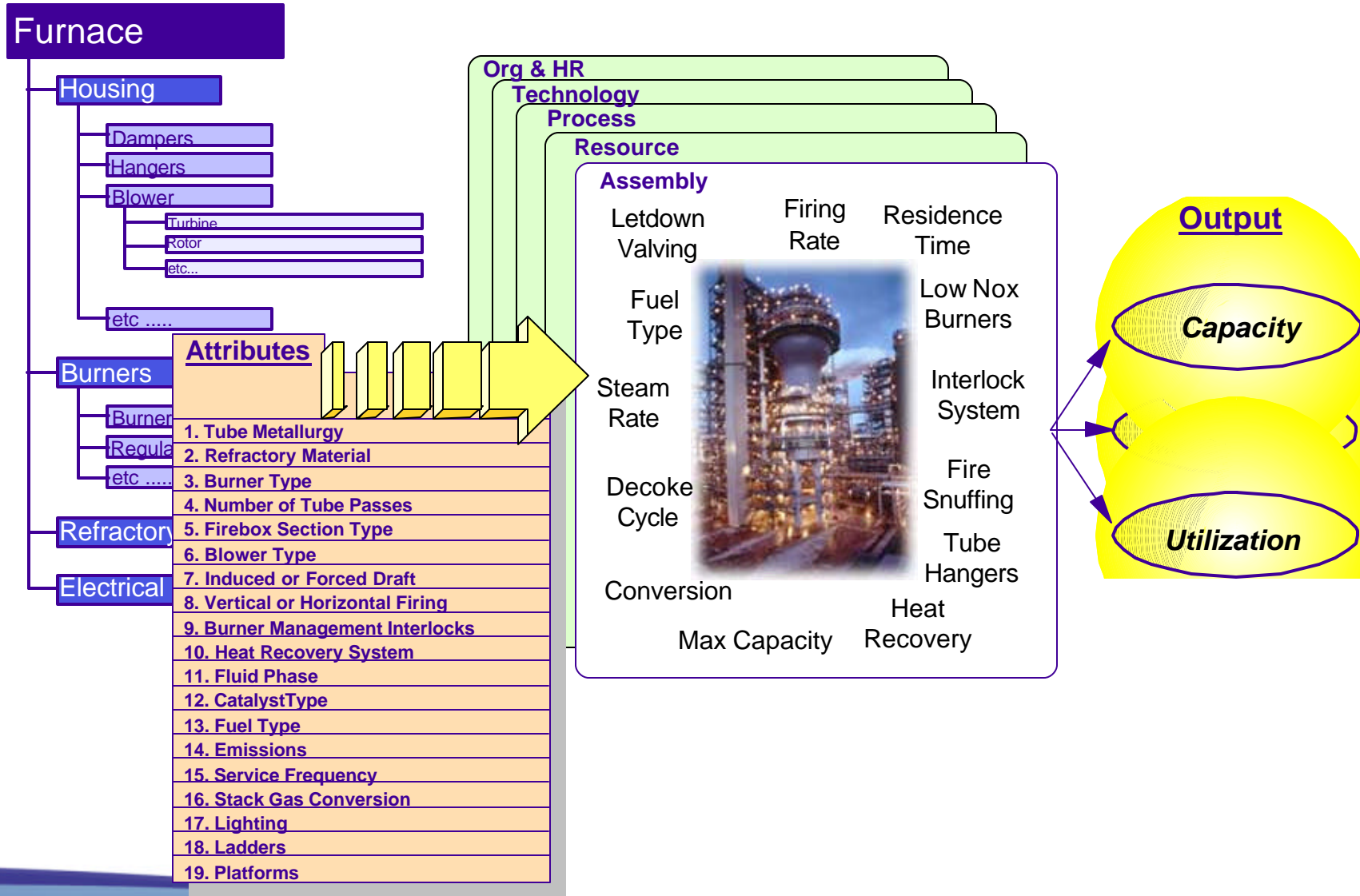*Business Templates*

Reusable Know-How

80% standard units and 20% plant-specific units

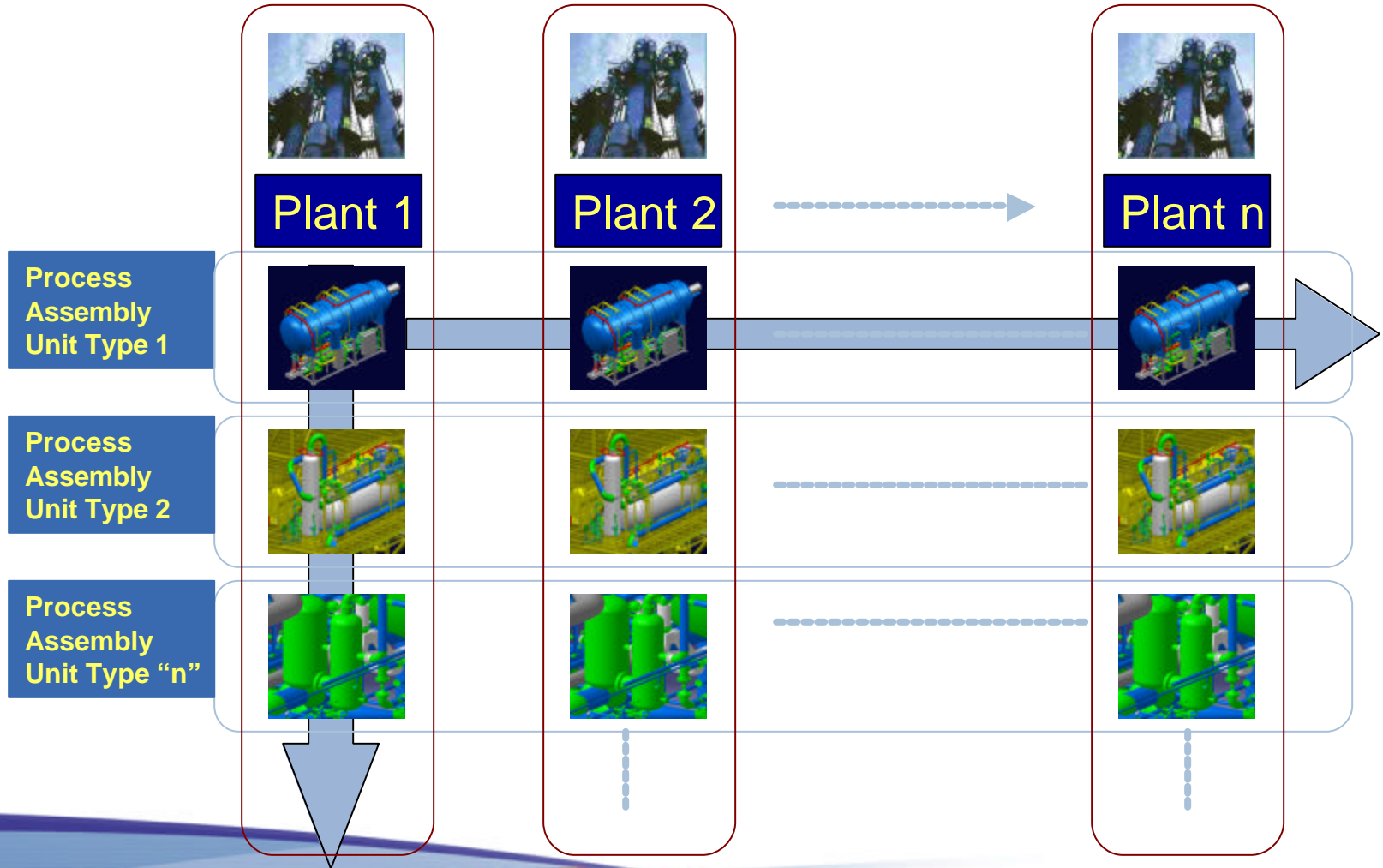**Feasible with global plant economies of scale which now exist**

Reduces liability of having only individual plant know-how
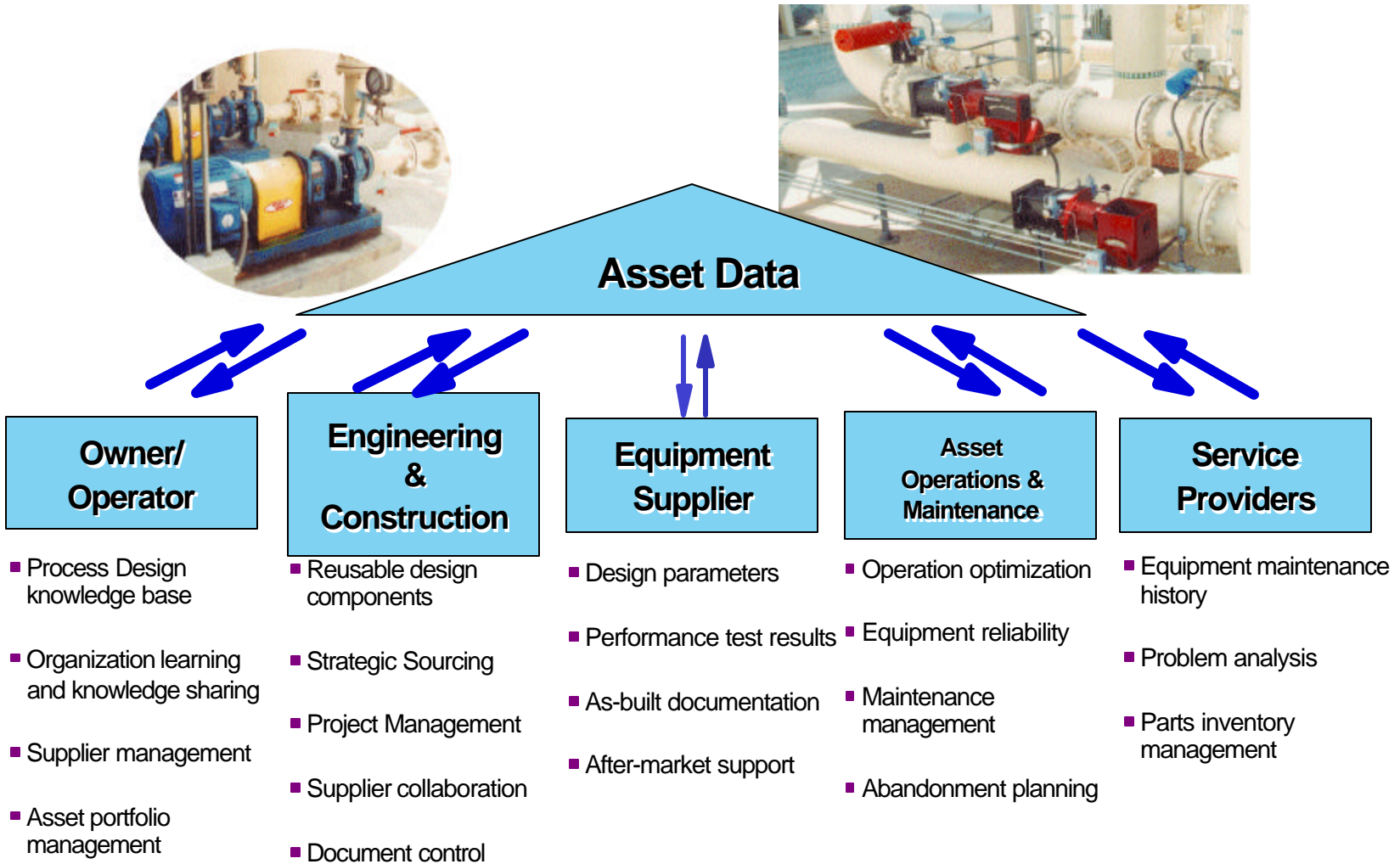
Enabled by the network-centric ALM business model

Business Template Example – Industrial Furnace

Furnace

- **Housing**
  - Dampers
  - Hangers
  - Blower
    - Turbine
    - Rotor
    - etc...
  - etc .....

- **Burners**
  - Burner
  - Regula
  - etc .....

- **Refractory**

- **Electrical**

Org & HR
Technology
Process
Resource
Assembly

Attributes

1. Tube Metallurgy
2. Refractory Material
3. Burner Type
4. Number of Tube Passes
5. Firebox Section Type
6. Blower Type
7. Induced or Forced Draft
8. Vertical or Horizontal Firing
9. Burner Management Interlocks
10. Heat Recovery System
11. Fluid Phase
12. CatalystType
13. Fuel Type
14. Emissions
15. Service Frequency
16. Stack Gas Conversion
17. Lighting
18. Ladders
19. Platforms

Letdown Valving

Firing Rate

Residence Time

Fuel Type

Low Nox Burners

Steam Rate

Interlock System

Decoke Cycle

Fire Snuffing

Tube Hangers

Conversion

Heat Recovery

Max Capacity

Output

Capacity

Utilization

Plant Fleet Economy of Scale

Reusable Know-How Across All Worldwide Locations

Plant 1

Plant 2

Plant n

Process Assembly Unit Type 1

Process Assembly Unit Type 2

Process Assembly Unit Type "n"

Asset Work Information

Asset Data

Owner/ Operator	Engineering & Construction	Equipment Supplier	Asset Operations & Maintenance	Service Providers
▪ Process Design knowledge base	▪ Reusable design components	▪ Design parameters	▪ Operation optimization	▪ Equipment maintenance history
▪ Organization learning and knowledge sharing	▪ Strategic Sourcing	▪ Performance test results	▪ Equipment reliability	▪ Problem analysis
▪ Supplier management	▪ Project Management	▪ As-built documentation	▪ Maintenance management	▪ Parts inventory management
▪ Asset portfolio management	▪ Supplier collaboration	▪ After-market support	▪ Abandonment planning	
	▪ Document control			

III. Typical Solution Components

Summary of C&P customer main drivers and issues

Upstream	Refining	Retailing	Commodity	Fine / Specialty
Reduce time to first oil				Improve Innovation time to market
Production Growth				
		Total Site Profitability		
		Become a best in class Retailer		
	Flawless Execution of Customer Orders		Flawless Execution of Customer Orders	
	Asset and Personnel Security		Asset and Personnel Security	

Make Collaboration an Integral part of the Strategy

Customer Loyalty - Recruit for Life

Improve Health Safety and Environmental Management

Improve Return on Assets

Improve Shareholder Value

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What is the solution footprint?

Solution Module	HW	SW	Services
integration module	20%	30%	50%
Operations & maintenance	20%	40%	40%
KM	5%	45%	55%
document management	20%	40%	40%
Supplier Collaboration	20%	30%	50%
HSE	20%	30%	50%

Asset Lifecycle Management Value Proposition

Asset Lifecycle Management provides the Chemical and Petroleum industry with a digital work environment which delivers relevant information and data to key stakeholders in a usable format on demand
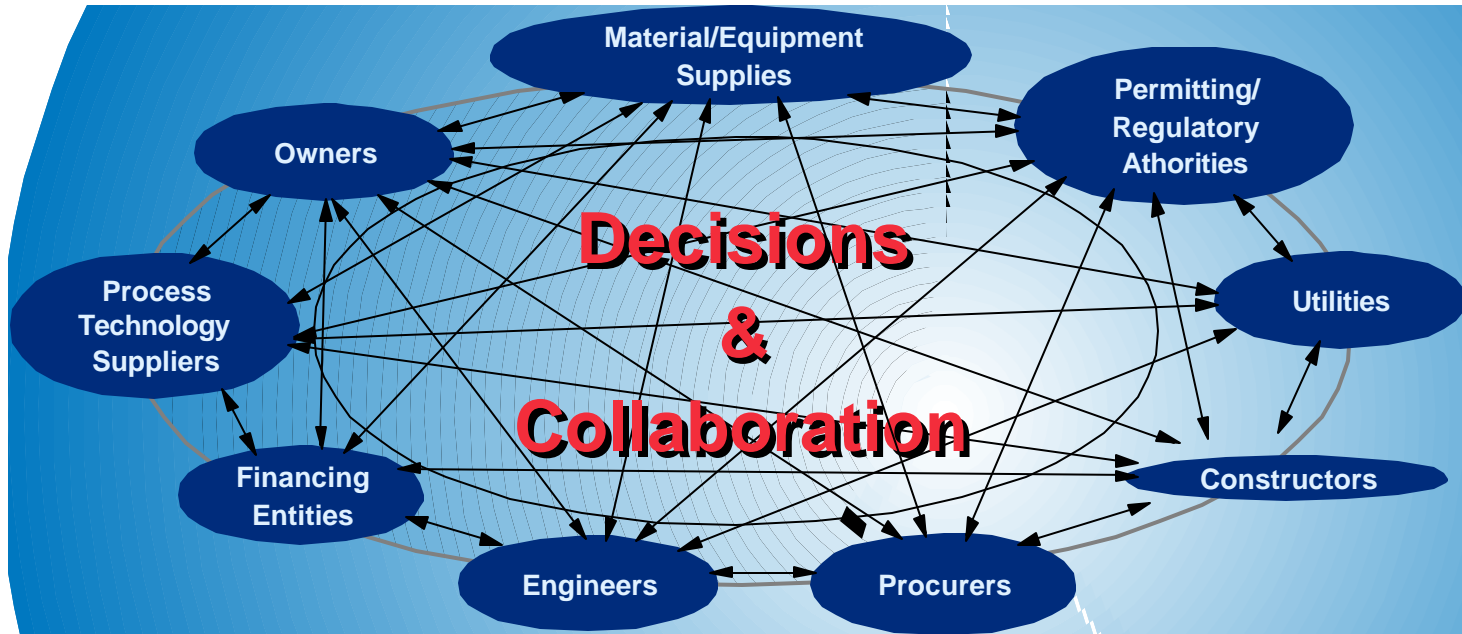
In doing so, C&P clients realize strategic effectiveness through speed of decision making and execution efficiency while achieving business objectives in a hyper competitive global industry

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Pain: "I Can't Control Asset Utilization"

- **Key Business Process Issues**
  - Supplier/Owner Asset Management
  - Unplanned Maintenance
  - Production Planning
- **Solution**
  - **Integration and Collaboration**
    - PPRGateway Module
    - Websphere
  - **Applications**
    - CATIA PLO, EQT, PIP, PID, STD
    - 3DCom
  - **Product Data Management** (Workflow Integration, Best Practice Sharing, Detail design from supplier in MCAD)
    - ENOVIA LCA, TeamPDM
  - **Simulation** (Maintenance Procedure)
    - DELMIA Quest, ERGO, 'IGRIP'
- **Business Value**
  - Increased production/uptime
  - Maintenance efficiency
    - Prefailure prediction
  - Decreased costs per unit of production
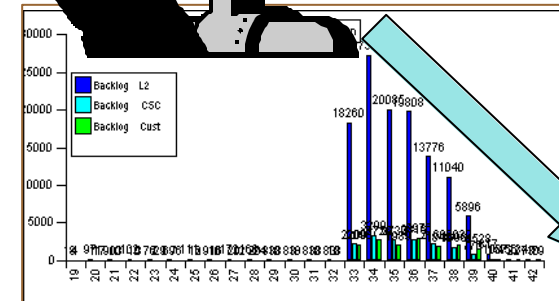
Pain: "I Can't Control Compliance Costs"

- Key Business Process Issues
    - Process (Emissions) Monitoring
    - Compliance Reviews
    - Reporting
- Solution
    - **Integration and Collaboration**
        - PPRGateway Module
        - Websphere
    - **Applications**
        - CATIA PLO, EQT, PIP, PID, STD
        - 3DCom
    - **Product Data Management** (Safety & process workflow, Best practices, Most effective technology global reference(s))
        - LCA, TeamPDM
    - **Simulation** (Simulation process for safety and environmental regs, Training (required) for operations))
        - DELMIA IGRIP, Quest, ERGO
- Business Value
    - Compliance expense reduction
    - Reporting efficiency/consistency
    - Assembly reference compliance

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Pain: "I'm Losing My Skill Base"

- **Key Business Process Issues**
  - Capture of knowledge
  - Training of people
  - Making know-how available on demand
- **Solution**
  - **Integration and Collaboration**
    - PPRGateway Module
    - Websphere
  - **Applications**
    - Knowledgeware
    - CATIA PLO, EQT, PIP, PID, STD
    - 3DCom
  - **Product Data Management** (Capture of best practices and workflow)
    - ENOVIA LCA, TeamPDM
  - **Simulation** (Maintenance procedures training, Safety procedures training, Determination and capture of best practices)
    - DELMIA IGRIP, Quest, ERGO
- **Business Value**
  - Capture know-how
  - Skills transfer
  - Know-how distribution

Asset Lifecycle Management Challenge

1. How to define Asset? _Product_

2. How to Maintain And Operate? _Process_
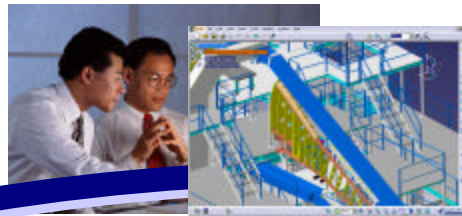
3. With What? _Resource_
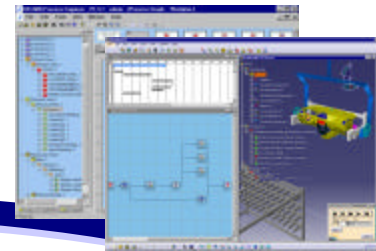
Monitoring Of Asset In use

Maintenance; Safety; Testing; Failure Modes
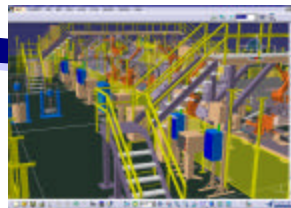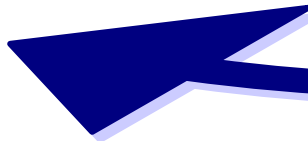
Assembly Deassembly

Evolution of in Data Integration

Access

Integration

Collaboration
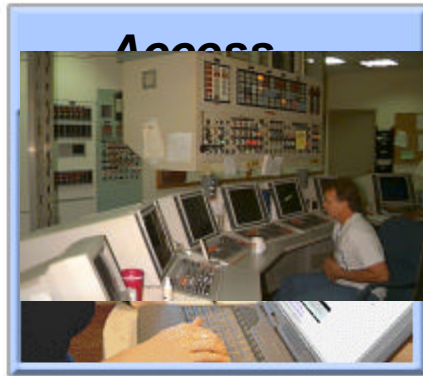
Automation,
Accessing to the
Operational Data,
Within the plant

Integration of Plant
Systems & Enterprise
Applications
Between Plants

Optimization & Simulation
Dynamic response
Business Workflow Intel.
B2B, B2C, Marketplaces
on demand

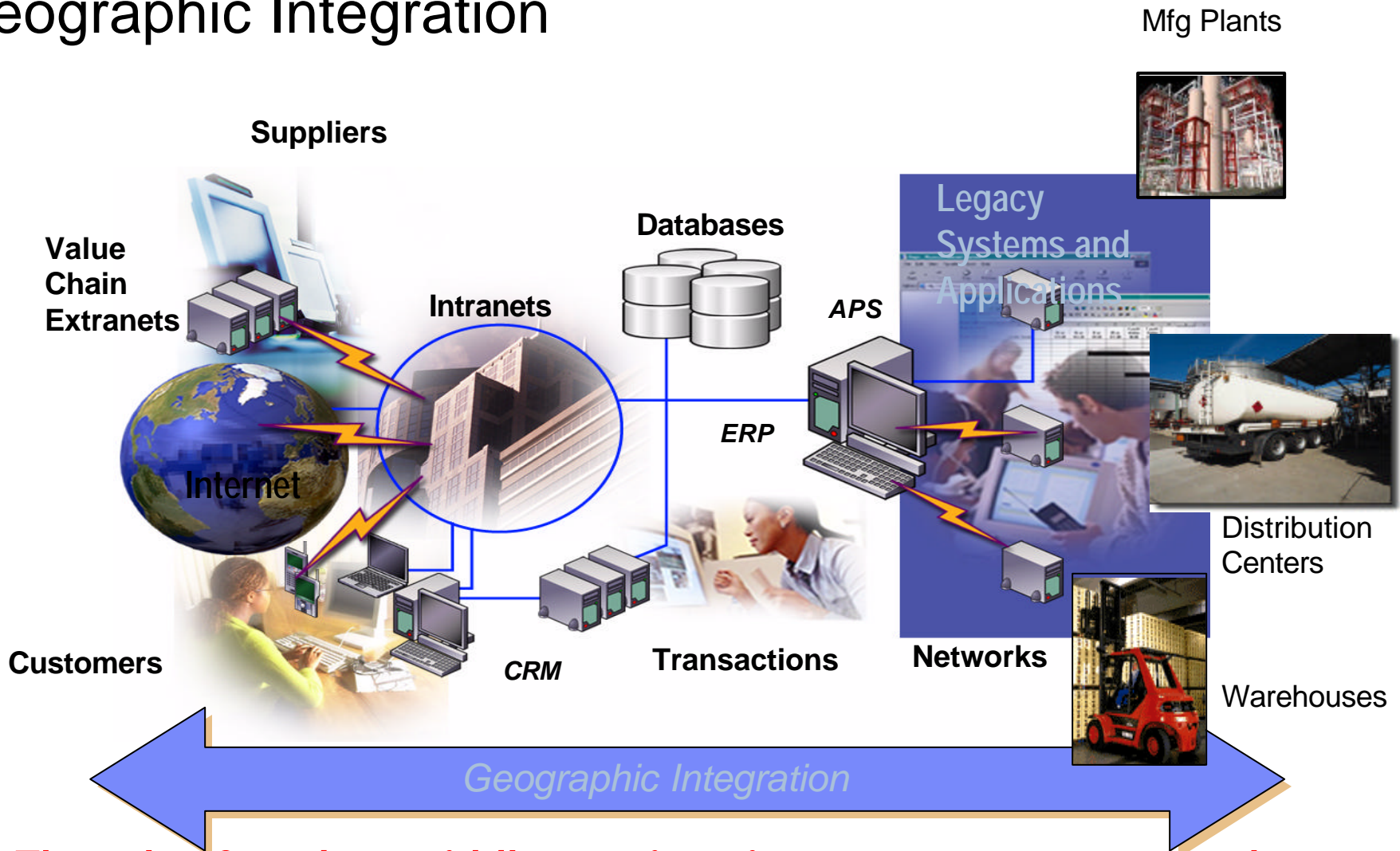Access | Publish | Transact | Integrate Internally | Integrate Externally | Adapt Dynamically

Horizontal & Vertical Integration

e-Procurement   SCM   PLM   ERP   CRM   e-Business   Marketplaces

EAI

Horizontal Integration

Vertical Integration

ENTERPRISE

Suppliers

Customers

PLANTS

Vertical Integration

Horizontal Integration

Warehousing

Inventory

Raw Materials

Production Launching

Plant Maintenance

Packaging

Shipping

Process Control

PAI

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Geographic Integration

Mfg Plants

Suppliers

Value
Chain
Extranets

Databases

Legacy
Systems and
Applications

APS

Intranets

Internet

ERP

Distribution
Centers

Customers

CRM

Transactions

Networks

Warehouses

Geographic Integration

The role of modern middleware is to integrate across geography.

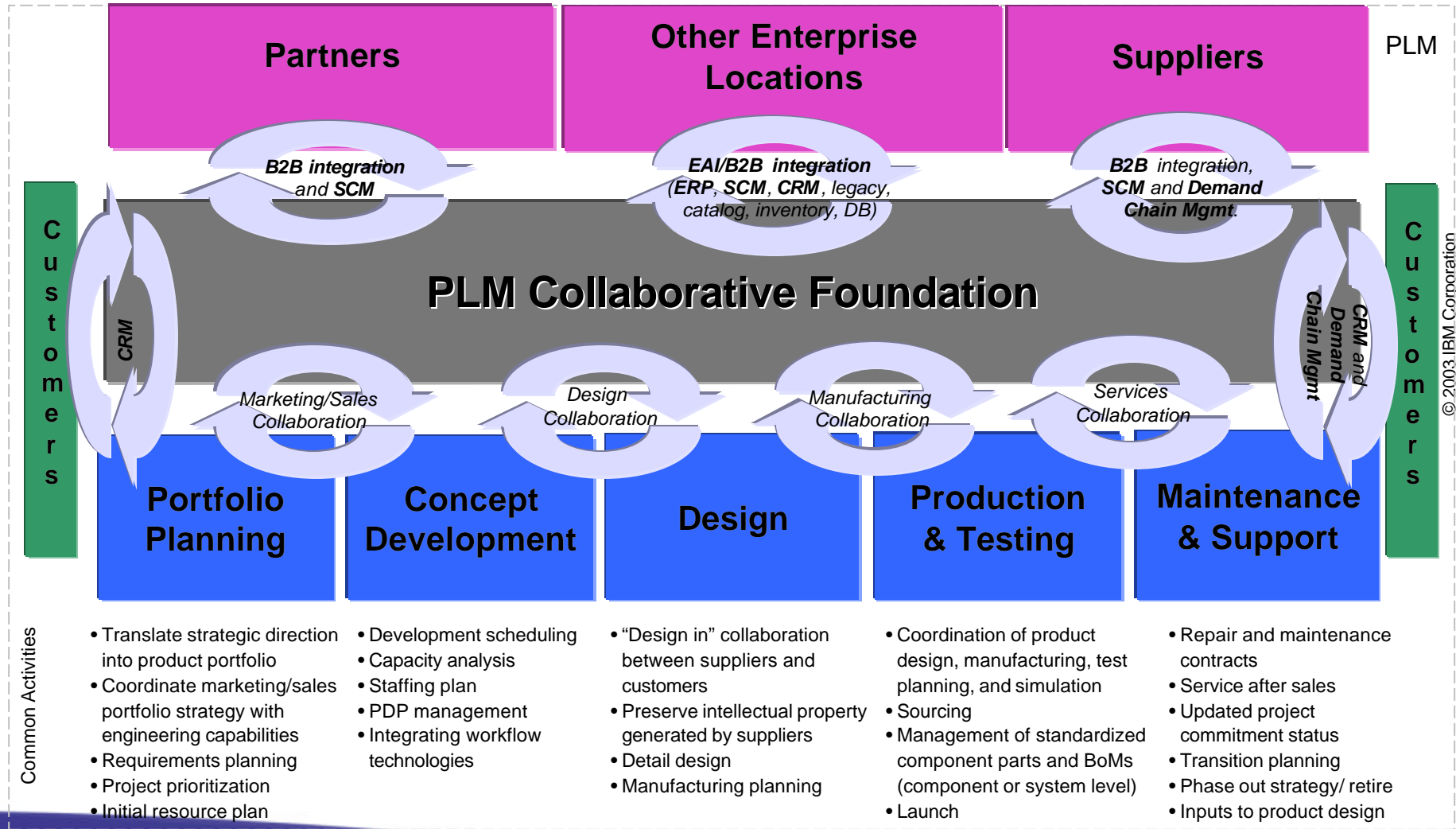# A Typical Application Collaboration Model with IBM Middleware in Chemical Industry
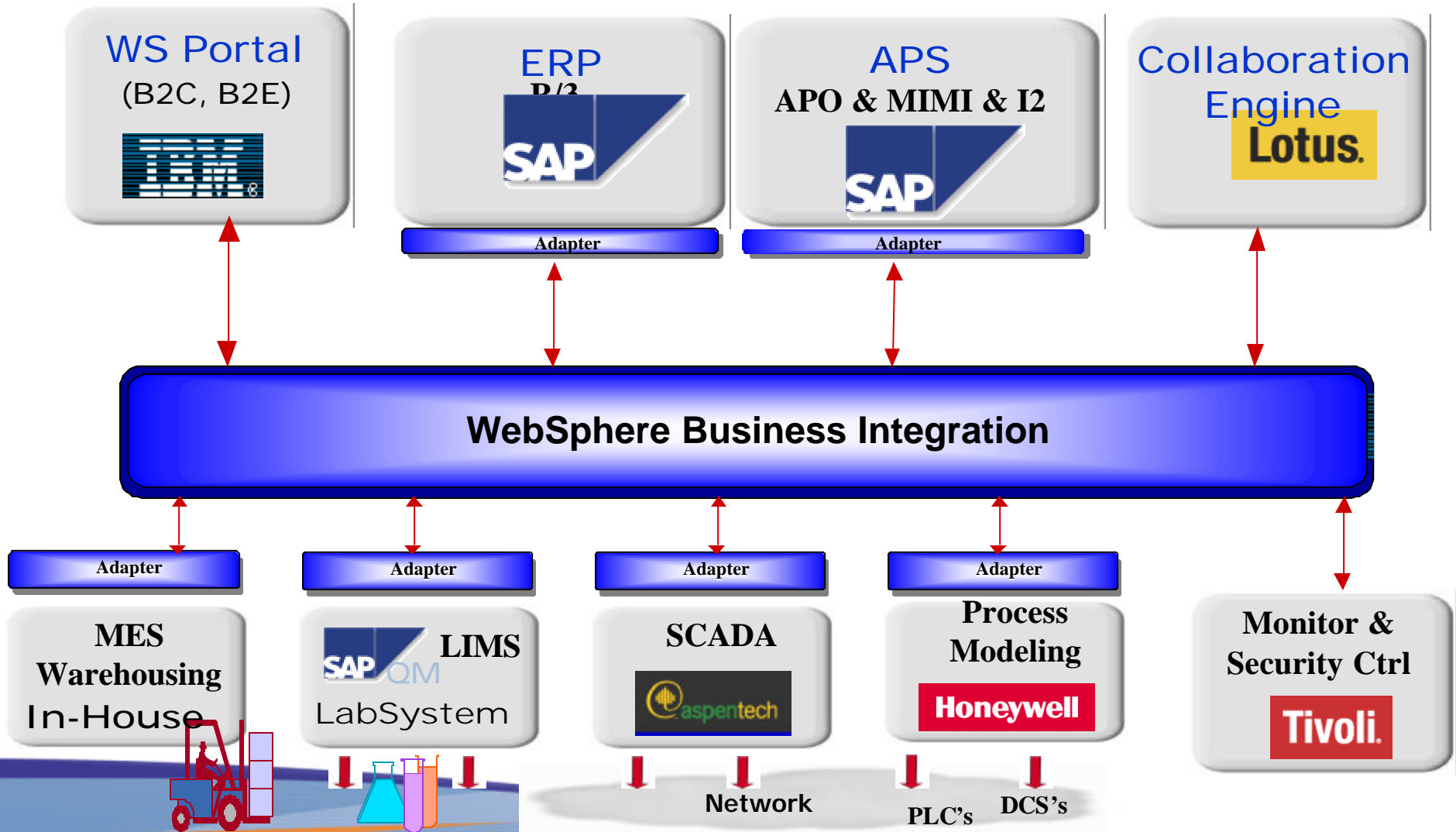
IBM / SAP Interoperability
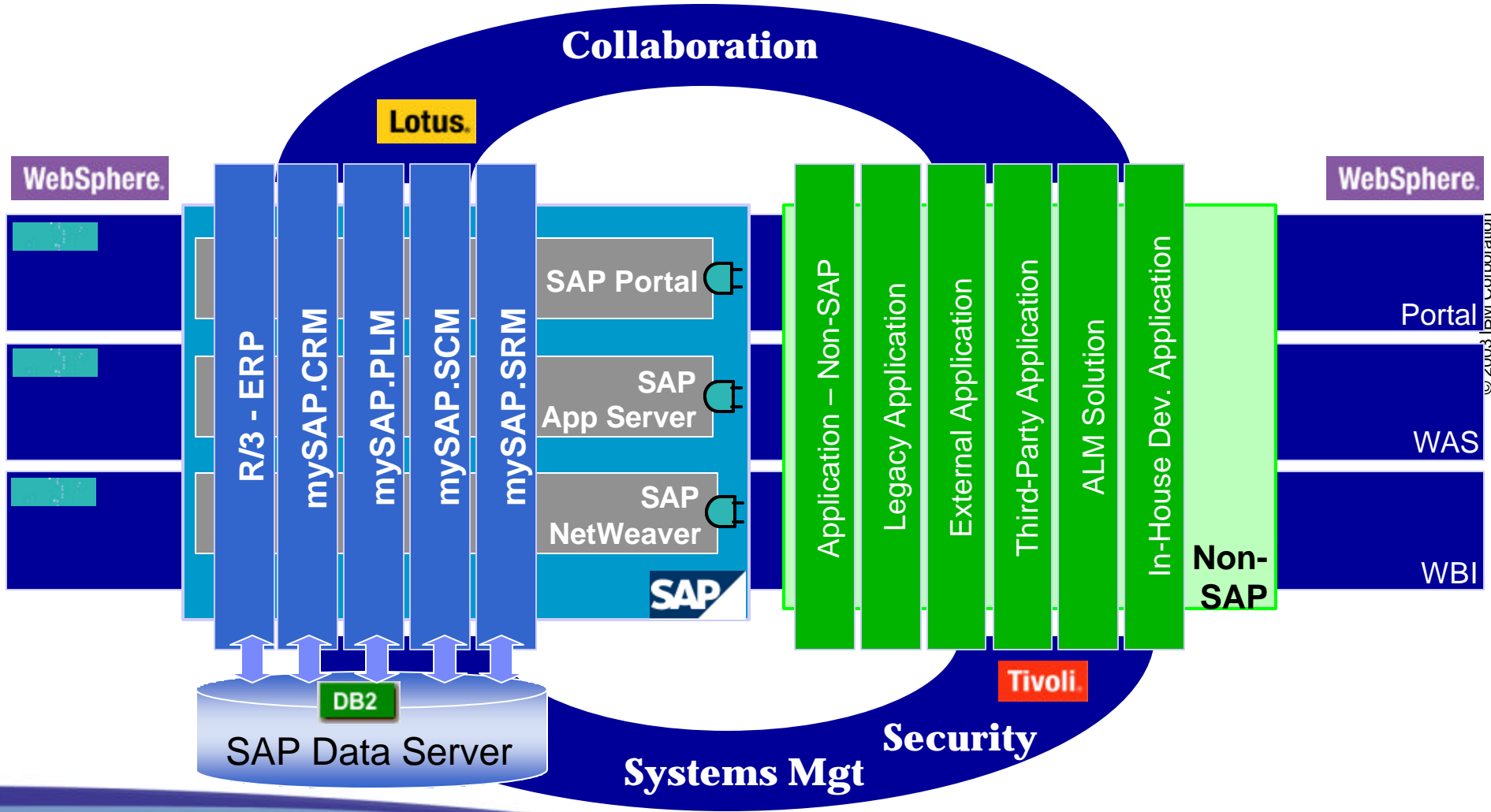
IV. How IBM PLM can help

Leading firms are designing the right products, improving time to market and reducing supply chain and service costs throughout the value chain
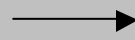

Partners

Other Enterprise Locations

Suppliers

PLM

B2B integration and SCM

EAI/B2B integration (ERP, SCM, CRM, legacy, catalog, inventory, DB)

B2B integration, SCM and Demand Chain Mgmt.

C u s t o m e r s

CRM

PLM Collaborative Foundation

CRM and Demand Chain Mgmt

C u s t o m e r s

Marketing/Sales Collaboration

Design Collaboration

Manufacturing Collaboration

Services Collaboration

Portfolio Planning

Concept Development

Design

Production & Testing

Maintenance & Support

Common Activities

- Translate strategic direction into product portfolio
- Coordinate marketing/sales portfolio strategy with engineering capabilities
- Requirements planning
- Project prioritization
- Initial resource plan

- Development scheduling
- Capacity analysis
- Staffing plan
- PDP management
- Integrating workflow technologies

- "Design in" collaboration between suppliers and customers
- Preserve intellectual property generated by suppliers
- Detail design
- Manufacturing planning

- Coordination of product design, manufacturing, test planning, and simulation
- Sourcing
- Management of standardized component parts and BoMs (component or system level)
- Launch

- Repair and maintenance contracts
- Service after sales
- Updated project commitment status
- Transition planning
- Phase out strategy/ retire
- Inputs to product design

Decisions made increasingly earlier in the lifecycle

Source: IBM Analysis.

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Our ALM strategy is driven by the value migration underway within our clients
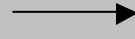
Customer Priorities

Intra-company asset development →　Inter-company integrated value chain
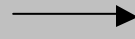
Purchase Criteria

Productivity tools →　Total platform services and best practice IC
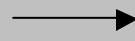
Customer Anger

Pain of fragmented enterprise tools →　Ineffective collaboration across life cycle
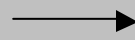
Decision Making / Power

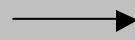Department managers →　"C" level executives

Buyer Behavior

Do it yourself point solutions →　Total business process and support services

Competitive Environment

Many point solution providers →　Consolidated full service competitors

PLM Value Migration

PLM is evolving from design tools to integrated processes that support the product lifecycle

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Key Customer Drivers	Engineering Productivity	Engineering Tool Functionality	Engineering Integration	Cross-Enterprise Integration

	Proprietary Tools	Point Products	Integrated Environments	Collaborative Utility

Product Development IT Landscape

Proprietary Tools:
- McDonnell Douglas → UniGraphics
- Dassault Aviation → Dassault Systems
- → CADAM
- Lockheed Martin
- AT&T Bell Labs
- DEC → Viewlogic
- Tektronics → Mentor Graphics
- Motorola
- HP
- Valid Logic
- Cadence
- IBM Design Solutions
- IBM Product Manager → ENOVIA
- Rational

Point Products:
- MCAD
- EDA
- PDM
- CASE

Integrated Environments:
- MCAD
- EDA
- CASE Tools
- Middleware
- PDM
- Middleware
- SCM
- CRM
- ERP

Collaborative Utility:
- **Managed Services**
  - Business Process Outsourcing
  - AMS
  - IT Outsourcing
- **Inter-prise Collaboration**
- **Utility**
  - On-Demand Services

1960s   **1980s**   **2000s**   **2010**

Customer needs are driving ALM investments in several areas

Primary Customer Needs

INTEGRATION	COLLABORATION	REDUCED TIME TO MARKET	REDUCED COST
(integration of disparate data, applications, suppliers, and customers)	*(collaboration and workflow communication between enterprise users dispersed across geographies and time-zones)*	*(contracting Asset life cycles and shorter delivery lead times)*	*(Lowering development costs through commonality, reuse and outsourced infrastructure)*
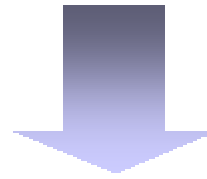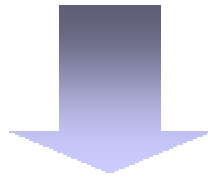
Solution Areas

Optimized Asset Management	Accelerated Time to First Oil & Asset Utilization	Implementation of Best Practices	Improved Product Quality And Service	Infrastructure Cost Reductions

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Industry Description / Benefits

- **Asset Lifecycle Management Solution provides the Oil and Gas industry a digital work environment which delivers relevant information and data to key process stakeholders in a usable format on-demand, allowing clients to realize strategic effectiveness through speed of decision making and execution efficiency while achieving business objectives in a hyper-competitive, global industry.**

- **Major Benefits**

  - ► **Increase asset up-time and reliability**

  - ► **Reduce Project Cycle Time**

  - ► **Retain asset information throughout the entire product life cycle in the supply chain.**

  - ► **Reduce operations, maintenance and exploration costs**

  - ► **Reduce maintenance window and time to market to increase revenue**

  - ► **Improve quality by sharing best practices and expertise**

Solution Characteristics

- **Leverages existing IT Investments**

- **Integrates legacy systems**

- **Based on underlying business processes**

- **Drives Efficiency of Communications through collaboration**

- **Reduces Cycle time and rework**

- **Reduces operating and maintenance expenses over life of asset by information re-use**

- **Help meet regulatory requirements easily at lower cost**

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CoE Building Blocks

Daily Collaboration

Common, Personalized, and Role Based Portal

WebSphere Portal

Program Management & Day to Day Collaboration

Quick Place, Primavera (Schedule, Risks, Issues)

Engineering & Design

Visualization

SmarTeam, Cimmetry Viewer

Engineering Collaboration

SmarTeam

Information Handover

Engineering DB

SmartPlant Foundation (Notia

Maintenance DB

Maximo

Document Mgt

SmarTeam, Documentum

Contractor/Supplier

RFx & Reverse Auction

SmarTeam Community,

eProcurement

SAP EBP (out of scope)

Asset Monitoring & Control

Project & Asset Performance

Asset Monitoring and Control

Telegnomic, ABLE (out of scope)

Performance Management

OutlookSoft

Workflow Routing & Approval

Workflow Routing

WebSphere, SmarTeam

IT Infrastructure

IT Infrastructure & Integration

WebSphere Application Server, WebSphere Business Integration & CrossWorlds, Tivoli

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Asset Management Solution

Knowledge Management
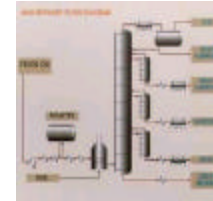
Monitoring& Project Management

Digital Asset Management

Workflow Management
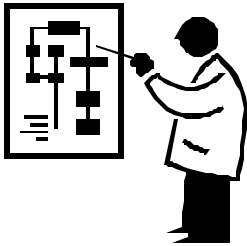
Specification Management

on demand

Digital Workspace

Metrics & Dashboards
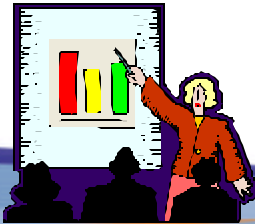
Project Collaboration

Robust Search Capabilities

Leading Suppliers of PLM SW and Services in Process Industries according to ARC

Leading Suppliers of PLM Software & Services in Process Industries

2002 Revenues = $727.4 Million
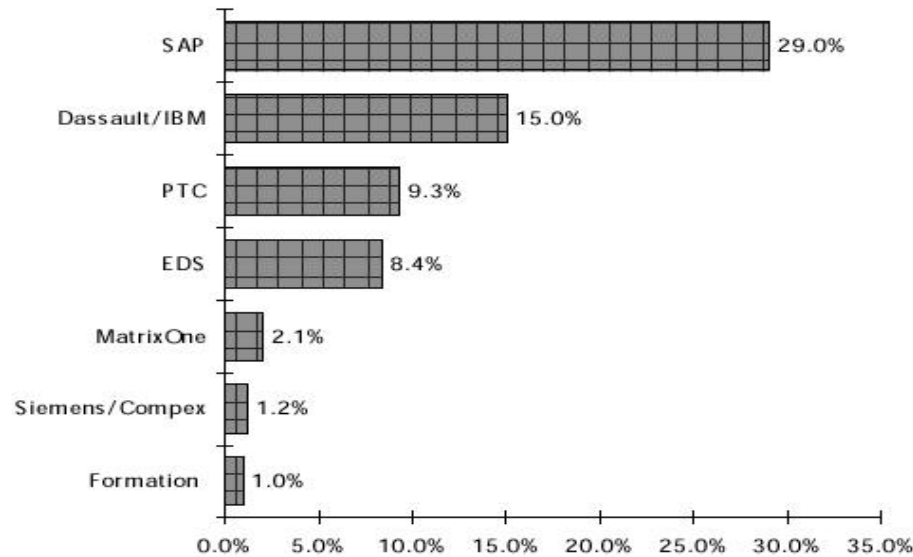
Other = 34.0 Percent

What are we Selling?

- **Services led Assessment with Value Proposition**
  - ✓ **ALM Assessment, PDM,Collaboration and Workprocess Diagnostic, Implementation, Rollout**

- **Application Lead Approach**
  - ✓ **PDM, Design Tool, Document Management, Workflow**

- **Middleware approach**
  - ✓ **Portal, integration and process & data federation**

Chemical & Petroleum – Asset Lifecycle Management Demo

XYZ Chemical Company

Area 51 Plant
Nowhere, AZ

Asset Lifecycle Management Portal

User Name: owner

Password: *****

Login   Close

- **Access key plan**

- **Remote monitoring of operations**

- **Maintenance and repair planning**

- **Inventory management**

- **Collaboration services**

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ALM Proof of Concept shown at Daratech Plant 2003

V. Customer References

Reference Accounts
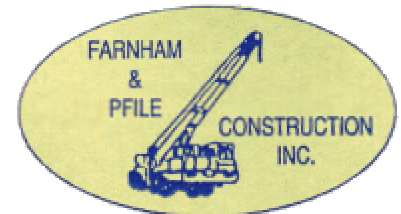
Kvaerner Oilfield Products to Implement $1M Product Lifecycle Management Solution from SmarTeam

Enterprise-wide data management solution to enhance efficiency, quality and innovation at leading manufacturer of undersea oil production systems
LONDON-Jan. 7, 2003

KVÆRNER™

By using SMARTEAM, KOP will be able to access and manage its data more effectively, facilitate the re-use of designs and drawings, create a single point of reference for engineers, replace its document control system and ultimately make substantial savings in engineering time. These benefits are further expected to have positive impact upon product quality and innovation.

"Since we constantly revisit and modify our designs, the retrieval and updating of files is difficult to manage," said Morten Braass, vice president of Project and Engineering Support at KOP. "We need to know that we are working with the correct designs and without SMARTEAM this has proven very difficult. Also, we need this data to work alongside our other business information. We had all these systems creating supposed knowledge, but they weren't talking to each other. A piece of the jigsaw seemed to be missing."