MAPPING INTEGRATED SUPPLY CHAIN SYSTEMS AND PROCESSES

By Philippe Lepercq

Principal Consultant – Supply Chain Execution
Oracular West, Inc. – Denver, Colorado
Philippe.lepercq@Oracular.com

April 2007

Why Map Supply Chain Processes and Systems?

As supply chain management technologies mature into mainstream acceptance, they are extended or replaced by the newest applications fueled by business necessity and technological innovation. The pace at which new "solutions" are introduced far exceeds that in which mature "solutions" are retired. Thus, supply chain managers in search of tools to support operations have an ever increasing number of technologies on the active market from which to choose.

The lack of holistic picture of where and how these technologies fit into the overall Supply Chain process prompted us to design an integrated map that coherently illustrates available technology and the process each supports. The map strives to demonstrate the touch-points that exist between critical supply chain processes in a cross-functional organization.

Before reviewing the map in detail it is important to stress that we approach its creation from the perspective that Business comes first. Proven management concepts are the foundation upon which this representation has been built. Therefore, our vision was to create a map that considers a supply chain in its desired state:

- Functions are aligned strategically and are part of the Supply Chain which is engineered to deliver enterprise goals.
- Product life cycle management occurs through the concurrent and cross-functional design of products and in order to minimize, cost, time-to-market, rework, and delays.
- There is a direct and bi-directional connection between the strategic and execution levels within the chain.
- IT (Information Technology) is used as an enabler of Supply Chain processes by creating "Electronic proximity" between the workgroups and cross-functional members of the chain.

The Supply Chain map is a matrix of vertical aligned areas (Supply, Product, Demand), and cross-functional (or horizontal) processes such as Product Design or Demand Forecasting. The map is intended for use as a reference tool during a strategic review or the design phase of supply chain architecture.

This map is by definition in constant evolution because of the appearance of new business models, processes and technologies.

We do not suggest nor would the reader agree that every supply chain process or technology is identified within the map. We do suggest that the map illustrates the core processes one must consider when assessing the design of a supply chain. We propose this map as a reference framework for the professional involved in supply chain analysis.

The Concepts of the Integrated Supply Chain

The purpose of a company is to bring to its customers, the product and services they need, where and when they need, at a profit. All business processes within the enterprise must have these objectives as underlying purpose of their being. All processes in the organization must focus directly or indirectly on this goal.

The need to meet customer demand in an efficient (profitable) manner has resulted in the build out real time operations, or if you prefer, Demand Driven Networks. DDN's respond to a demand signal then propagate this signal all the way through a network of suppliers and partners. Business models that increasingly rely on real time operations to satisfy customer demand require highly integrated tools and processes at both the execution and strategic levels within the operation.

Let's keep in mind the market forces that continue to drive, and justify, the significant investment in supply chain integration:

- Globalization expands the geographical span of operations which makes systems and process integration a significant competitive advantage
- Global competition necessitates the acceleration of product cycles, reduction of design-to-market times.
- Perpetual innovation reduces products-lifetimes.
- Customer demand and competitive pressures requires companies to have product and services available when and where needed. Thus, the rapid development of demand-driven models.
- Cost pressure is constant.
- Pressure to keep inventory levels at optimum level due to cost (mostly carrying and obsolescence costs) is a major constraint.
- Customers take high product quality and service levels for granted.

Because a company must often react to these market pressures with short term process and technology fixes, IT Information Systems infrastructures increasingly become patchworks of applications and technologies. This process is compounded by the comparatively slow evolutionary nature of enterprise resource planning systems (ERP).

ERP systems are the backbone of a business' information systems. These systems typically provide foundational business process support for financial, procurement, inventory, and human resource needs. Third party products are often leveraged, due to time to market advantages and niche expertise, to provide the most advanced capabilities and typically integrate with the ERP to complete the system.

Supply Chain solutions are an excellent example of this infrastructure phenomenon. Demands on the supply chain are constantly evolving, requiring organizations to manage more things. This demand is frequently satisfied by niche players with deep expertise in the particular functional area. Because niche players are frequently faster to market than the ERP OEM's, they often gain significant market strength in their area of expertise. These solutions gain success as niche modules that "plug" (integrate) into the ERP system. As these applications grow and mature, they become mainstream. The industry trend shows that the ERP providers tend to extend their packaged solutions through acquisition/absorption of the niche players. These include applications such as APS (Advanced Planning Systems), e-Commerce suites, Business Intelligence, Warehouse and Transportation Management, Customer Relationship Management and more recently Contract Management, Risk Management, Compliance Management, and Point of Sales solutions.

By the time this process fully evolves the patchwork of solutions described earlier is quite vibrant. One must consider the significant competitive disadvantage that waiting for the mainstreaming or OEM absorption of third party solutions could create. Although we agree that fully integrated packages from a single source are almost always advantageous, rarely do companies have that luxury. Market pressures require that businesses respond.

Our conclusion: don't worry about the perfect technology solution but rather; fix the process, when necessary enable it with technology, and ensure the interdependencies that exist between the new solution and the entire value chain are not compromised.

The Map

Ensuring that a well thought out and flawlessly executed point solution does not generate unintended consequences across the supply chain is the purpose for mapping the interdependencies at the process, technology and organization levels.

Our map is a simplified visual representation that lists the key areas and processes of the integrated Supply Chain, the information technology systems that support each, and the organizational structure that supports them all. Many processes are interconnected from a functional aspect. Technology is an enabler and provides a link between them.

The Integrated Supply Chain has **3 key Process Silos: Supply, Product, and Demand**. In addition, Cash Management stands by itself. Each silo is broken-down into **Process Disciplines**, as follows (See Table A):

Supply
- Strategic Network Optimization
- SRM: Supplier Relationship Management
- Production/Sourcing Planning

Product
- Product Design
- Production/Manufacturing

Demand
- Customer Relationship Management
- Demand Fulfillment

Table A

SUPPLY CHAIN PROCESSES AND INFORMATION SYSTEMS MAP

Process Silos	SUPPLY			PRODUCT		DEMAND		SEPARATE BUT EQUAL
Process Disciplines	STRATEGIC NETWORK OPTIMIZATION	SRM-PROCUREMENT	PRODUCTION/ SOURCING PLANNING	PRODUCT DESIGN	PRODUCTION	CRM-CUSTOMER RELATIONSHIP MANAGEMENT	DEMAND FULLFILLMENT	CASH MANAGEMENT
Functional Layers	SHARED RESOURCES (KNOWLEDGE, HR, FINANCIALS, ADMIN, LEGAL)							
	INFORMATION TECHNOLOGY							
	EXECUTIVE LEADERSHIP							

Each process discipline and its associated process are presented separately in Tables B – D.

Strategic and Support Functions

In addition to the key process silos, across the bottom, **3 cross-functional layers** represent Shared Resources, Information Technology, and Executive Leadership. Although the three functional layers are not detailed in the map a description of each is contained below:

1. **Shared Resources** provide on-going support to the company's business operations. They include the following functions: HR, Financials, Administration, Legal, Knowledge etc
2. **Information Technology** is everywhere by providing and maintaining the information systems that irrigate every part of the organization.
3. **Executive Leadership** or Top Management is the layer that defines strategies, gives the impulse and orchestrates all activities. A process to create an integrated supply chain organization requires first a strong executive leadership, because it involves most functions in the enterprise. Breaking the traditional silos and building cross-functional processes needs a change in culture and managerial practices first.

Supply Chain Processes

Each Process Silo and Discipline is illustrated in a separate table below. Presented in horizontal lines are the Supply Chain Processes and their supporting technologies that support each Process Discipline.

Even though we are not attempting to group processes into well defined families, we can still identify attributes that help in understanding the map.

- **Commonly Shared Processes**: Processes like Strategic Alignment & Planning which, in order to create a coherent corporate strategy, need to be aligned across all Process Disciplines. Performance Management and Knowledge Management are examples of common processes.
- **Cross Functional Processes**: Are processes like Product Design. In a concurrent design organization, several functional areas have a piece of the action: Marketing, Design/Development, Manufacturing, Sourcing/purchasing. Each party brings its specific skill and focus into this cross-functional process, but in an integrated manner. Such processes, integrating several functions also include Product/Service rollout plans (involve Design, Sourcing, Manufacturing, Sales

and Distribution functions); or Sourcing and Manufacturing Planning (Marketing, Sales, Manufacturing, Procurement).

- **Area Specific processes**: Processes such as Spend Analysis, Supplier Contract Management, in the Supply side, Manufacturing Process Design in the Product side, and Demand Generation in the Demand side. These processes, feed from other areas but are executed in a fairly contained and local way.
- **Execution Processes**: Process like e-Sourcing or Procure-to-Pay on the Supply side; Make-Product on the Product Side; and Order-to-Cash on the Demand side. This is the transactional operations level. This level is the most Information Technology intensive in terms of number of applications involved, as well as, the of volume of information processed.

Note: Supply Chain processes illustrated on the same level within a Process Discipline (e.g., supply Chain Process #3), are not necessarily related to one another between Disciplines.

Supporting Technologies

Each process is presented with one or several supporting technologies. Most applications are being used across multiple processes and therefore, appear in multiple places on the map.

Some tools can be organizational (such as Project Management, Process Modelers); many applications are components of larger ERP packages; and some more specialized applications are standalone systems. As mention previously, over time these disparate specialized applications either are absorbed by the ERP providers, or at least, become fully integrated third party extensions of the ERP system.

SUPPLY CHAIN PROCESSES AND INFORMATION SYSTEMS MAP

SUPPLY CHAIN PROCESS	SUPPLY		
	STRATEGIC NETWORK OPTIMIZATION	SRM-PROCUREMENT	PRODUCTION/SOURCING PLANNING
Supply Chain Process #1	Business Alignment and Strategic Planning	Business Alignment and Strategic Planning	Business Alignment and Strategic Planning
Supporting Technology	BI (Business Intelligence) /BPM (Business Performance Management); Strategy Modeler	BI (Business Intelligence) /BPM (Business Performance Management); Strategy Modeler	BI (Business Intelligence) /BPM (Business Performance Management); Strategy Modeler
Supply Chain Process #2	Line of Business Models- Develop a strategy using results of Modeling tools.	Integrated Design for Source	Integrated Design for Launch
Supporting Technology	BPM/APS (Advanced Planning System); Strategy Modeler	Project Management; ERP (Product Data Management); Component Banks	Project Management; ERP (Product Data Management; Capacity Planning); APS
Supply Chain Process #3	Network Optimization : Optimum location of end users, manufacturing, suppliers, and partners within the supply chain. Demand Driven Supply Network	Supply Base Management: select and manages suppliers in order to maximize their value to the organization.	Inventory Strategy: determine optimum Inventory Level
Supporting Technology	APS (Advanced Planning System)	APS (Advanced Planning System); Suppliers Databases	APS (Advanced Planning System); Forecasting Tools, ERP (DRP-Distribution Replenishment Planning, MRP-Manufacturing Resources Planning, Capacity Planning)
Supply Chain Process #4	Supply Chain Risk Management	Spend Management: Analyze spending patterns by commodity.	Components Bank Management
Supporting Technology	SCRM-Supply Chain Risk Management; PRM- Procurement Risk Management; Contract Portfolio Simulations	Spend Management; ERP (Procurement, Spend Management)	ERP (PDM-Product Data Management); Component Banks
Supply Chain Process #5	Supply Chain Compliance Management (SOX, Export regulation, Currency, Languages, Customs, Safety etc)	Integrated Strategic Sourcing : integrate sourcing internally and externally.	Integrated New-Product/Service Rollout
Supporting Technology	Compliance Management	e-Sourcing tools (RFI, RFP; e-auctions); Planning (APS; DRP, MRP); Supplier Self Service; Forecasting; Electronic market places; Suppliers Pools;	Project Management; APS
Supply Chain Process #6		Supplier Contract Management: manage contracts, terms, purchasing prices, milestones; ensure contract compliance Etc	
Supporting Technology		Contract Management; ERP (Procurement)	
Supply Chain Process #7		Procure-To-Pay: fulfill sourcing needs-Requisitions, PO, Approval, Dispatch orders, Receive, approve payment, Pay. Import/Inbound logistics.	Demand -To-Plan: convert demand into forecast, into sourcing need, then plan.
Supporting Technology		ERP- (Procurement; Supplier Self Service; Financials (A/P; G/L); MRP, DRP); e-Procurement; EDI; Contract Management; Warehouse Management-WMS; TMS-Transportation Management -	APS, ERP (Forecast, MRP, DRP, Production Planning); Customer Self Services
Supply Chain Process #8	Performance Management	Performance Management	Performance Management
Supporting Technology	Web based performance measurement tools for Overall Supply Chain; integrated with other applications. BPM, Data Warehouse; BI; Digital Dashboard, Scorecards	BPM; Web based performance measurement tools for SRM; integrated with other applications. BPM, Data Warehouse; BI; Digital Dashboard; Suppliers Scorecards.	Web based performance measurement tool for Planning; integrated with other applications .BPM, Data Warehouse; BI; Digital Dashboard, Scorecards.
Supply Chain Process #9	Knowledge Management	Knowledge Management	Knowledge Management
Supporting Technology	Document Management; Multiple databases: Demography, economic trends and situation, regulations, environment issues, climate, social environment.	Document Management; Commodity/Supplies Database	Document Management; Databases
	SHARED RESOURCES (KNOWLEDGE, HR, FINANCIALS, ADMIN, LEGAL)		
	INFORMATION TECHNOLOGY		
	EXECUTIVE LEADERSHIP		

SUPPLY CHAIN PROCESSES AND INFORMATION SYSTEMS MAP

SUPPLY CHAIN PROCESS	PRODUCT	
	PRODUCT DESIGN	PRODUCTION
Supply Chain Process #1	Business Alignment and Strategic Planning	Business Alignment and Strategic Planning
Supporting Technology	BI (Business Intelligence) /BPM (Business Performance Management); Strategy Modeler	BI (Business Intelligence) /BPM (Business Performance Management); Strategy Modeler
Supply Chain Process #2	Integrated Design-To-Market	Integrated Design for Make
Supporting Technology	Project Management; CAD (Computer Assisted Design); PDM; Product Configurator; Product Referential	Project Management; CAD (Computer Assisted Design); PDM
Supply Chain Process #3	Supply Base Management: suppliers contribute early to the design process.	Manufacturing Network Optimization
Supporting Technology	Suppliers Databases	APS (Advanced Planning System)
Supply Chain Process #4	Components Bank Management	Manufacturing Process Design
Supporting Technology	ERP (PDM-Product Data Management); Component Banks	CAD; ERP (PDM; Production Control-Routing); Process Modelers
Supply Chain Process #5	Integrated New-Product/Service Rollout	Integrated New-Product/Service Rollout
Supporting Technology	Project Management	Project Management; APS; Capacity Planning
Supply Chain Process #6	Design in Compliance: product meets requirements-Test	Asset Life-Cycle Management: identify assets, plan maintenance, downtimes etc
Supporting Technology	Project Management; Testing Database	ERP (Financials, Asset Management; Work Orders; Jobs Cost)
Supply Chain Process #7		Make Products- Demand-Driven Manufacturing
Supporting Technology		ERP (Manufacturing, Lean Manufacturing); MES - Manufacturing Executions Systems; Bar Coding systems; RFID
Supply Chain Process #8	Performance Management	Performance Management
Supporting Technology	Web based performance measurement tools for Design; integrated with other applications. BPM, Data Warehouse; BI; Digital Dashboard, Scorecards.	Web based performance measurement tools for Production; integrated with other applications. BPM, Data Warehouse; BI; Digital Dashboard, Scorecards
Supply Chain Process #9	Knowledge Management	Knowledge Management
Supporting Technology	Document Management; Databases: Regulations; Licenses etc	Document Management; Databases
	SHARED RESOURCES (KNOWLEDGE, HR, FINANCIALS, ADMIN, LEGAL)	
	INFORMATION TECHNOLOGY	
	EXECUTIVE LEADERSHIP	

SUPPLY CHAIN PROCESSES AND INFORMATION SYSTEMS MAP

	DEMAND		
SUPPLY CHAIN PROCESS	**CRM – CUSTOMER RELATIONSHIP MANAGEMENT**	**DEMAND FULLFILLMENT**	**CASH MANAGEMENT**
Supply Chain Process #1	Business Alignment and Strategic Planning	Business Alignment and Strategic Planning	Business Alignment and Strategic Planning
Supporting Technology	BI (Business Intelligence) /BPM (Business Performance Management); Strategy Modeler	BI (Business Intelligence) /BPM (Business Performance Management); Strategy Modeler	BI (Business Intelligence) /BPM (Business Performance Management); Strategy Modeler
Supply Chain Process #2	Integrated Design for Market	Integrated Design for Deliver	Budget and Financial Forecast
Supporting Technology	Project Management	Project Management	BPM; Financial Applications (G/L - General Ledger; A/P-Account Payables; A/R= Account Receivables)
Supply Chain Process #3	Customer Base Management (Customer Segmentation)	Distribution Network Optimization	Financial Model of Network
Supporting Technology	APS (Advanced Planning System)	APS (Advanced Planning System); WMS	APS (Advanced Planning System); BPM
Supply Chain Process #4	Demand Generation	Transportation Optimization	Spend Management
Supporting Technology	Customer/Leads Databases; Pipeline Management; Customer Self Services; Forecasting Tools	APS; TMS; Tracking tools	Spend Management; ERP Financials
Supply Chain Process #5	Integrated New-Product/Service Rollout	Integrated New-Product/Service Rollout	Capital Appropriation
Supporting Technology	Project Management; APS; Forecasting tools	Project Management; APS; Forecasting Tools	Financials
Supply Chain Process #6	Customer Contract Management		Asset Life-Cycle Management
Supporting Technology	Contract Management; ERP -Sales Order Management; Sales Pricing		ERP (Financials, Asset Management)
Supply Chain Process #7	Customer Support	Order-To-Cash - Order Fulfillment - (SO Processing, Store products, Deliver, Reverse Logistics); Replenish; Products Packaging	Cash Cycle Management
Supporting Technology	CRM application	ERP - Sales Order Management; Product Configurator, Sales Pricing, Financials, TMS, WMS; Bar-Coding, RFID, Voice Recognition; Customer Self-Service; e-Sales Portal, , Financials (A/R), Export Documents; EDI, POS-Point of Sales	ERP (Financials; A/R- Account Receivables; A/P-Account Payables)
Supply Chain Process #8	Performance Management	Performance Management	Performance Management
Supporting Technology	Web based performance measurement tools for Customer Management; integrated with other applications. BPM, Data Warehouse; BI; Digital Dashboard, Scorecards.	BPM - Web based performance measurement tools for Fulfillment; integrated with other applications. BPM, Data Warehouse; BI; Digital Dashboard, Scorecards	Web based performance measurement tools for Cash Management; integrated with other applications. BPM, Data Warehouse; BI; Digital Dashboard, Scorecards
Supply Chain Process #9	Knowledge Management	Knowledge Management	Knowledge Management
Supporting Technology	Document Management; Marketing data bases etc.	Document Management; Databases	Databases: regulations (SOX...)
	SHARED RESOURCES (KNOWLEDGE, HR, FINANCIALS, ADMIN, LEGAL)		
	INFORMATION TECHNOLOGY		
	EXECUTIVE LEADERSHIP		

GLOSSARY OF ACRONYMS

ACRONYM	DESCRIPTION
A/P	Account Payables
A/R	Account Receivables
APS	Advanced Planning and Scheduling
BI	Business Intelligence
BPM	Business Performance Management
CRM	Customer Relationship Management
DRP	Distribution Replenishment Planning
EDI	Electronic Data Interchange
ERP	Enterprise Resources Planning
G/L	General Ledger
IT	Information Technology
MES	Manufacturing Execution System
MRP	Manufacturing Resources Planning
PDM	Product Data Management
PM	Project Management
POS	Point of Sales
RFID	Radio Frequency Identification
SCM	Supply Chain Management
SCRM	Supply Chain Risk Management
SOM	Sales Order Management
SOX	Sarbanes Oxley
SRM	Supplier Relationship Management
TMS	Transportation Management System
WMS	Warehouse Management System