
INFO 210 - 24 September 2007

Bob Glushko
Plan for Today's Lecture

Information Flow and Exchange Models

- Between enterprises (e.g., supply chains, marketplaces)
- Internal to an enterprise (e.g., Staple Yourself)
- Between enterprises and their human customers (e.g., personalization)
Businesses have long dealt with each other by exchanging information, usually in the form of documents.

The simplest case is the exchange of a catalog - an offer to provide goods or services -- and a customer order.

We use concepts like "supply chains" and "distribution channels" as metaphors for the coordinated or choreographed flow of information and materials/products between businesses.

These are complex patterns composed from the simple binary exchange pattern.

Information Exchange Patterns
The "Stack" of Information Exchange Patterns

*Business model or organizational*
patterns: marketplace, auction, supply chain, build to order, drop shipment, vendor managed inventory, etc.

*Process* patterns: procurement, payment, shipment, reconciliation, etc.

*Document* patterns: catalog, purchase order, invoice, etc.

*Component*
patterns for the pieces of information that are the semantic building blocks for documents: party, item, quantity, date, address, etc.
The Business EcoSystem
In Contrast to Facilities Map - A Physical Model

Facilities Location Map

Manufacturing Facilities
Kecskemét, IA
Fordo, TX
Belt, CA

Distribution Facilities
Kecskemét, IA
Ft. Madison, IA
Quincy, IL
Carthage, MO
Laredo, TX
Oakland, CA
San Bernardino, CA

Warehousing Locations
Springfield, MA
Edison, NJ
Bridgeview, IL
Paw Paw, MI
Ft. Madison, IA
Quincy, IL
Carthage, MO
Laredo, TX
Oakland, CA
San Bernardino, CA

Our plants are capable of manufacturing a variety of products to meet your needs. Our logistics network allows us to offer timely uninterrupted service throughout the United States.
Supply Chain Depicted as Physical Model
Supply Chain Depicted as Conceptual Model
Supply Chain Design [1]

Your business model and strategy sets the framework for design of the supply chain.

Supply chain structures (like the number of suppliers and distributors) are shaped by industry characteristics and product architectures.

Supply chains reflect many interconnected decisions about allocation of materials, production, and distribution responsibilities.
Supply Chain Design [2]

Location of manufacturing facilities and how to transport materials and goods to and from them

Location of suppliers and distributors with respect to manufacturing facilities

How many distributors and other intermediaries between the manufacturer and customers (0 or more)?

How much inventory to maintain at each stage

How visible are secondary tiers (suppliers of suppliers (of suppliers...))?
The UC Berkeley Service System "Supply Chain"
Indirect Distribution

Departments aren’t allowed to sell direct to customers; they must use the indirect channel of the university to award degrees.
University as Service Marketplace
The Role of Teaching Assistants

Does a TA provide course materials to the instructor as a Tier 2 supplier?

- or contribute course materials directly as a Tier 1 supplier?
Attacking Supply Chain Problems

Supply chain problems primarily result from poor visibility and lack of collaboration.

The visibility problem can be attacked by the use of technologies and strategies that speed information flow across the chain or that allow more information to be shared in controlled ways.

But controlling the flow of information has long been a source of competitive advantage... how can firms resolve these competing goals?
The Information Supply Chain

The flow of materials and goods in a supply chain is accompanied by information about it.

But information about supply chain activities and processes is increasingly separated from the physical flow of materials and goods, and for information-based services there is no physical stuff.

The information supply chain has become especially important because new technologies and techniques are providing relatively greater leverage than interventions with the physical supply chain.
Design Issues for the Information Supply Chain

What information is exchanged?

Which entities in the supply chain are able to exchange information?

What is the frequency of this information exchange?
Supply Chain Complexity with Outsourcing
Supply Chain Complexity with Outsourcing

As outsourcing grows more complex, the information flow involves more than the immediate supplier or customer.

The cost reductions from outsourcing must be weighed against the loss of access to critical information about quality, inventory, and capacity.

For example, reducing warranty costs requires connecting the far ends of the supply chain, from field service personnel to components suppliers.
Invest in the Appropriate Type of Supply Chain Information (McKinsey)

What information in a supply chain is most important depends on the type of product.

**COMMODITY** goods (PCs, low-end servers) face continuous downward cost pressure.

**FASHION** goods (trendy cell phones, music players) have short life cycles, unpredictable demand, and are consumer-driven.

**ENGINEERED** goods (high-end routers, storage equipment) have long life cycles, but undergo substantial design changes and have many configurations.

**STABLE** goods (electronic components for autos) change more slowly and are procured in high-volume, long-term contracts.
"In the Middle" -- Hub/Bus Architecture for Information Exchange
Information Aggregation and Exchange Patterns "in the Middle"

Marketplaces and Auctions

- Bring together sellers (or their catalogs)
- Bring together buyers (or their RFIs or RFQs)
- Match buyers and sellers
- Provide critical mass and infrastructure for other service providers

A "supply chain hub" can be thought of as a "private marketplace" run by the manufacturer/assembler in which all the participants are there because of a business relationship with the entity running the hub
Services Provided "in the Middle" [1]

- Setting or selecting standards for protocols and messages
- Protocol and format conversion so that messages can be delivered and made mutually intelligible
- Routing documents between senders and receivers
- Registry and directory services so that participants and service providers be located or "discovered"
Services Provided "in the Middle" [2]

Core services (order management, content management)

Interfaces for services provided by others (logistics, shipping, tax calculation, credit, payment, reputation, etc.)

Support for "business process choreography" to create virtual combinations of the shared services

Aggregation (actual or virtual) seller catalogs with semantic integration (normalized and standard classification and description)
"Staple Yourself to an Order"

10 steps in the Order Management Cycle define a company’s way of doing business.

Because the OMC is an end-to-end system, every employee who affects an Order is the equivalent of a frontline worker.

But most companies don’t view the OMC as a system, and most executives have a simplistic or incorrect model.

<table>
<thead>
<tr>
<th>Customer Participation</th>
<th>Steps in the Order Management Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>plans to buy</td>
<td>1. Order planning</td>
</tr>
<tr>
<td>gets sales pitch</td>
<td>2. Order generation</td>
</tr>
<tr>
<td>negotiates</td>
<td>3. Cost estimation and pricing</td>
</tr>
<tr>
<td>orders</td>
<td>4. Order receipt and entry</td>
</tr>
<tr>
<td>waits</td>
<td>5. Order selection and prioritization</td>
</tr>
<tr>
<td>waits</td>
<td>6. Scheduling</td>
</tr>
<tr>
<td>accepts delivery</td>
<td>7. Fulfillment</td>
</tr>
<tr>
<td>pays</td>
<td>8. Billing</td>
</tr>
<tr>
<td>negotiates</td>
<td>9. Returns and claims</td>
</tr>
<tr>
<td>complains</td>
<td>10. Postsales service</td>
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"Staple Yourself to an Order" -- Organizational Responsibilities

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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>plans to buy</td>
<td>1. Order planning</td>
<td>✆</td>
<td>✆</td>
<td>✆</td>
<td>✆</td>
<td>✆</td>
<td>✆</td>
<td>✆</td>
<td>✆</td>
<td>coordinates</td>
</tr>
<tr>
<td>gets sales pitch</td>
<td>2. Order generation</td>
<td>✆</td>
<td>✆</td>
<td>✆</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>some</td>
</tr>
<tr>
<td>negotiates</td>
<td>3. Cost estimation and pricing</td>
<td>✆</td>
<td>✆</td>
<td>✆</td>
<td>✆</td>
<td>✆</td>
<td>✆</td>
<td>✆</td>
<td>✆</td>
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<td></td>
<td>none</td>
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<td>5. Order selection and prioritization</td>
<td>✆</td>
<td>✆</td>
<td>✆</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>some</td>
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<td>✆</td>
<td>✆</td>
<td>✆</td>
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<td></td>
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<td></td>
<td>none</td>
</tr>
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<td>✆</td>
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<td></td>
<td>none</td>
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<td>✆</td>
<td>✆</td>
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<td>✆</td>
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<td>✆</td>
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<td></td>
<td></td>
<td></td>
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<td>none</td>
</tr>
</tbody>
</table>
"Staple Yourself to an Order" -- Cracks in the OMC

What are the (horizontal) cracks described in the article and why do orders fall through them?

What are the (vertical) knowledge gaps and why do they exist?

What does it mean that "not all orders are created equal" and why does it matter?

Why is it important to chart the OMC?

Why is it important to look at OMC priorities from customer's perspective?
The Order Management Service System
Participants in the OMC
Personalization

Mills & Moberg: "Service systems can be viewed on a structure continuum from Full-service to Restricted service"

Scheduling techniques attempt to shift demand to maintain some target level of service quality for all customers

PERSONALIZATION approaches exploit information and computation to provide content and quality of service appropriate for specific customers

- Information about customer needs and preferences
- Computing resources to enable effective capture, management, analysis, and initiative based on customer information
Architectures for Personalization

(a) Provider-centric

(b) Consumer-centric

(c) Market-centric
Architectures for Personalization

Adomavicius & Tuzhilin describe three architectures for personalization

They contrast them topologically in terms of where the "personalization engine" is located in the service system

It is also helpful to contrast on the basis of which side of the provider-consumer relationship initiates and controls the personalization
Personalization Process
What Information is Needed to Personalize?

"Who the customers are and how they behave"

"Demographic and psychographic information"

"Comprehensive information... converted into actionable knowledge"
Where Does the Information Required for Personalization Come From?

From the consumer:
- Surveys and forms
- Transactional records
- Behavioral records, navigation history

From data brokers, using keys obtained from the consumer

From other consumers who are similar to the target consumer
## Building a Customer Profile with Data Mining

### Factual

<table>
<thead>
<tr>
<th>CustomerId</th>
<th>LastName</th>
<th>FirstName</th>
<th>BirthDate</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>0721134</td>
<td>Doe</td>
<td>John</td>
<td>11/17/1945</td>
<td>Male</td>
</tr>
<tr>
<td>0721168</td>
<td>Brown</td>
<td>Jane</td>
<td>05/20/1963</td>
<td>Female</td>
</tr>
<tr>
<td>0730021</td>
<td>Adams</td>
<td>Robert</td>
<td>06/02/1959</td>
<td>Male</td>
</tr>
</tbody>
</table>

### Transactional

<table>
<thead>
<tr>
<th>CustomerId</th>
<th>Date</th>
<th>Time</th>
<th>Store</th>
<th>Product</th>
<th>CouponUsed</th>
</tr>
</thead>
<tbody>
<tr>
<td>0721134</td>
<td>07/09/1993</td>
<td>10:18am</td>
<td>GrandUnion</td>
<td>WheatBread</td>
<td>No</td>
</tr>
<tr>
<td>0721134</td>
<td>07/09/1993</td>
<td>10:18am</td>
<td>GrandUnion</td>
<td>AppleJuice</td>
<td>Yes</td>
</tr>
<tr>
<td>0721168</td>
<td>07/10/1993</td>
<td>10:29am</td>
<td>Edwards</td>
<td>SourCream</td>
<td>No</td>
</tr>
<tr>
<td>0721134</td>
<td>07/10/1993</td>
<td>02:02pm</td>
<td>RiteAid</td>
<td>LemonJuice</td>
<td>No</td>
</tr>
<tr>
<td>0730021</td>
<td>07/10/1993</td>
<td>08:34pm</td>
<td>Edwards</td>
<td>SkimMilk</td>
<td>No</td>
</tr>
<tr>
<td>0730021</td>
<td>07/10/1993</td>
<td>08:34pm</td>
<td>Edwards</td>
<td>AppleJuice</td>
<td>No</td>
</tr>
<tr>
<td>0721168</td>
<td>07/12/1993</td>
<td>01:13pm</td>
<td>GrandUnion</td>
<td>BabyDiapers</td>
<td>Yes</td>
</tr>
<tr>
<td>0730021</td>
<td>07/12/1993</td>
<td>01:13pm</td>
<td>GrandUnion</td>
<td>WheatBread</td>
<td>No</td>
</tr>
</tbody>
</table>

### Discovered rules (for John Doe)

1. Product = LemonJuice => Store = RiteAid (2.4%, 95%)
2. Product = WheatBread => Store = GrandUnion (3%, 88%)
3. Product = AppleJuice => CouponUsed = YES (2%, 60%)
4. TimeOfDay = Morning => DayOfWeek = Saturday (4%, 77%)
5. TimeOfWeek = Weekend & Product = OrangeJuice => Quantity = Big (2%, 75%)
6. Product = BabyDiapers => DayOfWeek = Monday (0.8%, 61%)
7. Product = BabyDiapers & CouponUsed = YES => Quantity = Big (2.5%, 67%)
The Personalization Mandate at the Four Seasons Hotel

A & T claim that because personalization is information- (and often computation-) intensive, personalization systems are more effectively implemented in the online world than the "offline" one.

But let's not forget that a service system can be multichannel, with both online and offline components.

The Four Seasons (and Ritz-Carlton, etc.) line of luxury hotels exemplifies this kind of personalization delivered by a person but enabled by information systems:

- Any request made by a customer is recorded, and thus is available at any FS property.
- Employees are expected to demonstrate some aspect of "personalization" in every service encounter.
- Special case where the customer instructs the employees NOT to do so...
For 26 September


Healthcare Service Systems -- Zach Gillen, Huiliang Lui