The Supply Chain Eco-System Framework: Global Supply Chains

N. Viswanadham
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The Basic Ecosystem

Institutions

Supply Chain Ecosystem

Supply Chain

Resources

Delivery Services Infrastructure
The Four Forces in Detail

- Supply Chains
- Delivery Services Mechanisms
- Institutions
- Resources
Ecosystem Aware Global Supply Chain Management

Global Supply Chains
Modularity in Product and Process

- **Modular Product**
  - Made by appropriately combining different modules
  - Provides customers a number of options for each module and thus the product
  - Products differ from each other in terms of the subsets of modules assembled to produce them

- **Modular Process**
  - Each module undergoes a specified set of operations making it possible to outsource its manufacturing & inventory them in semi-finished form

- **Modular Organization Structure**
Supply Chain Trends: Modularity and Outsourcing

- Modular Products, Standardized Production Processes, and Outsourcing lead to Modular Supply Chains.
- Standardized component manufacturers have become IP monopolies and wield global market power (Intel chips, Windows OS, Auto components)
- Products have become commodities with the availability of Codifiable and Easily Replicable Knowledge about assembling the final product.
- The strategic competitive advantage for assemblers (Dell, GM, Nokia) moves from factory to managing the global supply chain and social capital with stakeholders.
China assembles all iPods, but it only gets about $4 per unit – or just over 1% of the US retail price of $300

451 parts that go into the iPod

Hard Drive by Toshiba → Japanese company, most of its hard drives made in the Philippines and China; it costs about $73 - $54 in parts and labor -- so the value that Toshiba added to the hard drive was $19 plus its own direct labor costs

Video/multimedia processor chip by Broadcom → American company with manufactures facilities in Taiwan. This component costs $8.

Controller chip by Portal Player → American company with manufactures. This component costs $5.

-Final assembly → done in China, costs only about $4

The unaccounted- parts and labor costs came to about $110

The largest share of the value added in the iPod goes to enterprises in the US → $163 of the iPod’s $299 retail value in the US: $ 75 for distribution and retail, $80 to Apple, and $8 to domestic component makers.

Types of Standardization

- **Part Standardization**
  - Common parts are used across many processes
  - Products redesigned as necessary

- **Process Standardization**
  - Standardizing as much of the process as possible, making a generic or family product
  - Final product assembly delayed until the customer order is received i.e. Called “Postponement”
Product Modularity in Automobiles

Different Modules in an Automobile

Source:
Manufacturing Firms in Electronics
Rise of EMS Firms

- **Electronic manufacturing services (EMS)** are a set of companies that design, test, manufacture, distribute, and provide return/repair services for Electronic OEMs.

- **EMS firms grow through increased scope & scale**
  - Increased outsourcing from OEMs.
  - Acquisitions of underutilized manufacturing assets of OEMs and SMEs in manufacturing and product design.

- **CM, ODM & CDM** are the three popular EMS segments.
Business Segments: CM & CDM

- **Contract manufacturing (CM)**
  - Does Manufacturing and packaging, design supplied by OEMs.
  - Component suppliers are specified by the OEM

- **Contract Design and Manufacturing (CDM)**
  - CM + Product design + SCM + logistics + Eng services
  - IP for design is still with OEM
  - Does design changes resulting in higher margins
    - To improve manufacturability based on experience of producing similar products for several OEMs
    - Savings in sourcing and logistics by using same components for products from different OEMs
Original Design and Manufacturing (ODM)

- ODMs initiate designs, manufacturing, IP & licensing etc. and shop for Owner. They
  - Develop unbranded products and sell them.
  - Can alter product design for manufacturability and cost.
  - Are co-located their design and manufacturing facilities to gain cost advantage.
  - Subcontract some activities to CMs.
Risks involved in the Three Segments

- CM – Need to manage manufacturing risks only
- CDM – In addition to manufacturing risk, the design may need modifications adding overseeing costs. The OEM bears the market risk.
- ODM – Both the technical and market risks are borne by the EMS firm and hence more responsibility
  - Extensive market analysis and development of product architecture.
  - Future risks may come in the form of constant upgradation of design expertise and manufacturing capabilities.
  - Needs intra-organizational coordination.
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Manufacturing Firms in Apparel
Types of Apparel Firms

- **Assembly/CMT**: CMT, “cut, make, and trim,” or CM. Designs & Fabric are supplied by the customer. Manufacturer cuts and sews fabric into garments.

- **Original Equipment Manufacturing**: Customer provides the design and specifies the raw materials. **OEMs** source and finance the fabric, provide all production and packaging services for delivery to the retail outlet.

- **Original Design Manufacturing (ODM)**: OEM organize and coordinates design of the product, selection, purchasing, of materials; all stages of production such as cutting, sewing, trimming, packaging & delivery of the finished product to customer.
Ecosystem Aware
Global Supply Chain Management

Transformation of the Organization of Electronics Production

Vertically Integrated Computer Industry (ca. 1950)

<table>
<thead>
<tr>
<th>Operating system</th>
<th>IBM</th>
<th>DEC</th>
<th>S P E R R Y - U N I V A C</th>
<th>W A N G</th>
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<tbody>
<tr>
<td>Chips</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Computer design</td>
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<td></td>
</tr>
<tr>
<td>Computer assembly</td>
<td></td>
<td></td>
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</tbody>
</table>

Vertically Specialized Computer Industry (present)

<table>
<thead>
<tr>
<th>Operating system</th>
<th>Windows</th>
<th>Mac</th>
<th>Unix</th>
<th>Linux</th>
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<td>Samsung</td>
<td>Texas Instruments</td>
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<td>HP/Compaq</td>
<td>IBM</td>
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<tr>
<td>Computer assembly</td>
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<td>Sanmina/SCI</td>
<td>Flextronics</td>
<td>...</td>
</tr>
</tbody>
</table>

Source: Byron Gangnes and Ari Van Assche, Modular Production Networks in Electronics: the Nexus between Management and Economics Research, September 30, 2004

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The Modular Corporation

Work processes in practically every big department of a corporation can now be outsourced and managed to some degree offshore. Some of the biggest sectors in terms of global spending in 2005:

**Human Resources**
$13 billion
Includes payroll administration, benefits, and training programs.

**Engineering**
$27 billion
Testing and design of electronics, chips, machinery, car parts, etc.

**InfoTech**
$90 billion
Software development, tech support, Web site design, IT infrastructure.

**Analytics**
$12 billion
Includes market research, financial analysis, and risk calculation.

**Customer Care**
$41 billion
Call centers for tech support, air bookings, bill collection, etc.

**Manufacturing**
$170 billion
Contract production of everything from electronics to medical devices.

**Finance & Accounting**
$14 billion
Includes accounts payable, billing, and financial and tax statements.

**Logistics & Procurement**
$179 billion
Includes just-in-time shipping, parts purchasing, and after-sales repairs.

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Business Week Posted on January 29, 2006
Modular Organization Designs

- Modularization of product designs paves the way for similar modularization of organization designs facilitating coordination of activities via an “information structure” rather than managerial authority or hierarchy.

- The codification of knowledge and standardization (through technical standards and design rules) of the interfaces between organizationally separate stages of production has made vertical specialization (organizational modularity) replace vertical integration.

- Codification, together with shared interface standards and design rules reduces the volume of information and hence the amount of knowledge sharing, that is required for inter-firm coordination.

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Conclusions

- The production has moved from Integrated manufacturing to dispersed manufacturing
- Codification of knowledge, standardization of processes and the inter-organizational interfaces has boosted the vertical specialization
- This has provided impetus to the growth of contract manufacturing firms and Outsourcing.