Lecture No.18: Purchasing Management

1. Concept/Subject/Organization of Purchasing Management
2. Purchasing Cycle and Its Management
3. Purchasing Management and Competitiveness: Case of Automobile

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1. Concept/Subject (Target)/Organization of Purchasing Management

Purchasing Management is

**Purchase**: standard-specification product (commercial product)

**Subcontract**: design/specs designated by owner

--- which are being included in “purchasing management” and “material management” in broad terms

**Logistics management** =

purchase management + in-house physical distribution management

+ physical distribution of final product

**Supply chain management (SCM)** =

optimum management of total chain
Range of Material Management

- material management
- purchasing management (broad term)
  - process management / Inventory management
  - traffic
  - physical distribution
- purchasing management (narrow term)
- subcontract management
- internal logistics
- external logistics
Classification of Material (1)

**Direct material**: retained in final product

**Indirect material**: tool, fuel, etc.

**Material**: low in degree of process

**Parts**
- formed and fabricated material (formed, before process)
- single part (processed)
- composite part (subassembly)
- functional part (having clear function)
- module (function self-contained, high composite level)
Classification of Material (2)

Purchased product —— standard product

Custom-design parts
- approved drawing/ consigned drawing items —— detail design by supplier
- loan drawing parts/process subcontract items —— detail design by auto companies

Open architecture = putting together industry standard parts being accepted
Closed architecture = variety of company-specific-design parts

Metal mold/jig tool: no-charge provision ⇔ paid provision ⇔ self-procurement
Material: no-charge provision (paid processing) ⇔ paid provision ⇔ self-procurement
Classification of Material (3)

Regular material
Allocated material (purchase in each case of necessity)

ABC Management
Part A ---- high value → major-emphasis management
Part B ---- medium
Part C ---- low value → abridged management
ABC Management in Purchasing

Part A
(major-emphasis management)
(order placement in each case)
(periodic order placement)

Part B
(fixed quantity order)

Part C
(fixed quantity order by simple purchase method)

Note: In parenthesis are examples of typical purchase management method for each category.

Takahiro Fujimoto
'Introduction to Production Management'
Nihon Keizai Shimbun, Inc. 2001 (Ⅱ p122 figure.12.2)
Purchasing Organization

Grown to an independent division gradually (particularly in large companies)

Purchasing staff size : 1–2% of factory employees in many industries

Japanese auto companies: tendency to have compact size

Concentration/Decentration of Purchasing Organization

Head-office level ⇔ business division level

Concentrated purchasing system : scale merit, mutual flexibility

Decentration purchasing system : flexible response, fostering manager

Cooperation with other divisions
Positioning of Purchasing Division in Total Company Organization

A. independent purchasing organization

B. purchasing organization within division

C. mixed organization

Reference: Tsukasa Shimazu
Phase Interface and Coordination Among Divisions

- Purchasing maker
  - Top management
  - Development
  - Production
  - Quality assurance
  - Production management

- Supplier
  - Top management
  - Development
  - Production
  - Quality assurance
  - Production management

Coordination/integration

"TOYOTA 'Supplier's guide 1996 TOYOTA' Nihon Keizai Shimbun, Inc.
Reference: Takahiro Fujimoto 'Introduction to Production Management' Nihon Keizai Shimbun, Inc. 2001 (Ⅱ p126)"
### 2. Purchasing Cycle and Its Management (volume product)

#### Structure of Purchasing Management

<table>
<thead>
<tr>
<th>up to conclusion of purchase contract</th>
</tr>
</thead>
<tbody>
<tr>
<td>purchasing organization (centralized purchase / decentralized purchase)</td>
</tr>
<tr>
<td>person(s) in charge of purchasing (buyer) recruitment/fostering</td>
</tr>
<tr>
<td>purchasing policy (purchase management rule)</td>
</tr>
<tr>
<td>material/parts design value analysis, value engineering (VA/VE)</td>
</tr>
<tr>
<td>decision on make or buy (in-house/subcontract manufacturing, provision of mold, loan of design drawing)</td>
</tr>
<tr>
<td>supplier development and market research on purchasing</td>
</tr>
<tr>
<td>decision on supplier (bid, development competition, special appointment order)</td>
</tr>
<tr>
<td>conclusion of purchase contract (basic contract, individual contract, paperwork)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>after start of purchasing management</th>
</tr>
</thead>
<tbody>
<tr>
<td>purchasing cost management (decision on purchasing price)</td>
</tr>
<tr>
<td>purchasing delivery management (timing of order placement, progress management, demand)</td>
</tr>
<tr>
<td>purchasing quantity/inventory management (ordering rule, order quantity, delivery frequency)</td>
</tr>
<tr>
<td>purchasing quality management (receiving inspection, no-inspection receiving, quality assurance responsibility)</td>
</tr>
<tr>
<td>transportation/warehouse management (transportation means, hand-over condition, warehouse network)</td>
</tr>
</tbody>
</table>

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Takahiro Fujimoto 'Introduction to Production Management'
Nihon Keizai Shimbun, Inc. 2001 (Ⅱ p127 figure.12.5)
## Model of Purchasing Management Policy

<table>
<thead>
<tr>
<th>Article</th>
<th>Item</th>
<th>Article</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>purpose</td>
<td>13</td>
<td>individual contract</td>
</tr>
<tr>
<td>2</td>
<td>definition</td>
<td>14</td>
<td>simplification of purchase office work</td>
</tr>
<tr>
<td>3</td>
<td>applicable range</td>
<td>15</td>
<td>securing of delivery time</td>
</tr>
<tr>
<td>4</td>
<td>purchasing category</td>
<td>16</td>
<td>provision and loan of property</td>
</tr>
<tr>
<td>5</td>
<td>data maintenance</td>
<td>17</td>
<td>receiving inspection</td>
</tr>
<tr>
<td>6</td>
<td>execution of advantageous purchase</td>
<td>18</td>
<td>disposal of defects</td>
</tr>
<tr>
<td>7</td>
<td>selection of quoter</td>
<td>19</td>
<td>payment</td>
</tr>
<tr>
<td>8</td>
<td>selection of estimate and supplier</td>
<td>20</td>
<td>training/fosterage of trading partner</td>
</tr>
<tr>
<td>9</td>
<td>handling of estimates</td>
<td>21</td>
<td>storage of document/ledger sheet</td>
</tr>
<tr>
<td>10</td>
<td>purchase approval</td>
<td>22</td>
<td>report</td>
</tr>
<tr>
<td>11</td>
<td>informal notice of order</td>
<td>23</td>
<td>training/assistance</td>
</tr>
<tr>
<td>12</td>
<td>basic contract</td>
<td>24</td>
<td>institution of business procedure regulation</td>
</tr>
</tbody>
</table>

Tsukasa Shimazu 'Book to understand Work of Purchase Control' NIPPON JITSUGYO PUBLISHING
Purchasing Policy

To put a through purchasing policy into a manual as purchasing management policy.

**VA (Value Analysis) / VE (Value Engineering)**

\[
\text{value} = \frac{\text{function}}{\text{cost}}
\]

From function’s view point, eliminate excessive facility, waste in design.

**VA**: volume production stage  **VE**: development stage

People buy “function”, not Mono (article).
Example of VE — same in function, but largely different in cost

Figure removed
due to copyright restrictions
Example of VA at Aoyama Seisakusho
("caulking" process method for oil switch valve)

完成品見取図

従来の工程
素材（丸棒）切断
→ 切削加工
→ 全体を焼入れ→歪みが生じる
→ 妻み取り
→ 研削3回 + パリ取り

素材（丸棒）圧造加工
→ 圧造加工
→ カラー（リング状）圧造加工→焼入れ
→ カラーの組み付け→「かしめ」
→ 研削1回

出所：青山製作所

成果：切削工程・歪み取り・パリ取りの省略、研削回数削減などにより、材料費などを大幅に低減。（世界初。特許取得済）
①そのものの使用によって価値が高まるか。
②その品物の原価と用途がつりあっているか。
③そのものの形状全部が必要であるか。
④使用目的にかなったものが他にないか。
⑤もっと低原価な作業方法で機能的な部品がつくれないか。
⑥もっと有用な標準あるいは部外供給業者の標準が発見されないか。
⑦使用される数量を考慮に入れた妥当な工具、設備で生産されているか。
⑧合理的な資材費、労務費、間接費および利潤は適正か。
⑨もっと安く提供する信頼できる業者はないか。
⑩それをもっと安く求めているものはないか。

Figure removed
due to copyright restrictions
Decision on Self-Manufacturing or Subcontracting (make or buy)

Draw a border line in product/process system

Its judgment criteria?

Japanese auto companies

— tendency for low in-house production
delivery in subassembly
relatively few primary makers

Used as a buffer in business depressions?
— not so much in Japanese auto makers
Rate of In-House Parts and Number of Trading Parts Suppliers

1. Case of low rate in-house production

2. Case of high rate in-house production

Takahiro Fujimoto 'Introduction to Production Management' Nihon Keizai Shimbun, Inc. 2001 (Ⅱ p128 figure.12.6)
Comparison of Parts Suppliers’ System in Japan and America (1980s)

Supplier system in Japan (1980s)
- Automaker
- the 1st parts supplier
- the 2nd parts supplier
- the 3rd and the 4th parts supplier

Supplier system in America (1980s)
- Automaker
- the 1st parts supplier
Comparison of Parts Procurement Structure in Japan and America (1980s)

GM:
in-house production 50%

assembly factory 32

in-house parts production factory 115

primary parts maker 2,500

secondary parts maker 10,000

Ford:
in-house production 45%

assembly factory 17

in-house parts production factory 50

primary parts maker 1,800

secondary parts maker 6,000

Toyota:
in-house production 30%

assembly factory 5

in-house parts production factory 5

primary parts maker 216

secondary and third parts maker 1,000

Author making (reference: 'Andersen Co.')
Approved Drawing Method and Loan Drawing Method

Problem on separating design works into in-house or subcontracting (custom design parts)

**Loan drawing**: detail design by ordering party

**Approved drawing**: detail design by order-receiving party (drawing owned by supplier)

**Consigned drawing**: detail design by order-receiving party (drawing owned by automobile companies)

Design sub-contract

→ development efficiency, time reduction ("Leave it to a specialist.") parts’ produce-ability (easiness of making)
### Types of Automobile Parts Trade: From Viewpoint of Outsourcing Design

<table>
<thead>
<tr>
<th>Type of Trade</th>
<th>work allocation on the parts</th>
<th>responsibility/authority</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>parts manufacturing</td>
<td>detail design</td>
</tr>
<tr>
<td>in-house production</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>loan drawing method</td>
<td>S</td>
<td>C</td>
</tr>
<tr>
<td>black box method</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>ready-made parts</td>
<td>S</td>
<td>S</td>
</tr>
</tbody>
</table>

**Note:** C signifies auto maker, and S parts maker. Reference was made to Banri Asanuma “Company Organization in Japan” Toyokeizai Shinposha regarding to “type of trade”. For simplification, work allocation relative to development works, etc., on metal molds/jig tools were omitted.

Takahiro Fujimoto 'Theory of Evolution of Production System' Yuhikaku Publishing Co., Ltd.
Allocation of Development Work in Finished Car Maker and Parts Maker

1. Ready-made parts (supplier proprietary parts)
   - Finished car maker
     - product concept
     - parts selection
   - Volume producer of parts
     - parts concept
     - target spec/layout
     - detail parts diagram, trial parts
     - production process
       - finished car

2. Approved drawing method/consigned drawing method (black box parts)
   - Finished car maker
     - product concept
     - target spec/layout
     - car test/drawing approval
     - production process
       - finished car
   - Volume producer of parts
     - detail parts diagram, trial parts
     - production process
       - parts

Suggestion

Takahiro Fujimoto, Clark K.B. 'Product Development Power' DIAMOND,Inc. 1991
3. Loan drawing method (functional parts model)  
(detail-controlled parts)

Finished car maker

- product concept
  - target spec/layout
  - detail parts diagram

Trial model parts maker

- trial parts

Production process

Parts

Finished car

Volume producer of parts

4. Loan drawing method (body parts model)  
(detail-controlled parts)

Finished car maker

- product concept
  - target spec/layout
  - detail parts diagram, trial parts

Production process

Parts

Finished car

Volume producer of parts

jig/mold provision

Legends: □ main information stock

main information flow

Takahiro Fujimoto, Clark K.B. 'Product Development Power' DIAMOND, Inc. 1991
Involvement in Development of Parts Maker

Estimated share of parts by parts’ makers against total parts development man-hours.
### Average of each region

<table>
<thead>
<tr>
<th>Results. ①:</th>
<th>Japanese enterprise in Japan</th>
<th>Japanese enterprise in the US</th>
<th>The US enterprise in the US</th>
<th>Each country enterprise in Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal mold change time (one minute)</td>
<td>7.9</td>
<td>21.4</td>
<td>114.3</td>
<td>123.7</td>
</tr>
<tr>
<td>Window time of new metal mold (week)</td>
<td>11.1</td>
<td>19.3</td>
<td>34.5</td>
<td>40.0</td>
</tr>
<tr>
<td>number of business gradings</td>
<td>2.9</td>
<td>3.4</td>
<td>9.5</td>
<td>5.1</td>
</tr>
<tr>
<td>Number of machines a worker.</td>
<td>7.4</td>
<td>4.1</td>
<td>2.5</td>
<td>2.7</td>
</tr>
<tr>
<td>Stock level (Sunday).</td>
<td>1.5</td>
<td>4.0</td>
<td>8.1</td>
<td>16.3</td>
</tr>
<tr>
<td>Delivered frequency during a day.</td>
<td>7.9</td>
<td>1.6</td>
<td>1.6</td>
<td>0.7</td>
</tr>
<tr>
<td>The number of faulty components (one-finished car). ②</td>
<td>0.24</td>
<td>—</td>
<td>0.33</td>
<td>0.62</td>
</tr>
<tr>
<td>Participation in design phase ③:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design rate (% that occupies it at all design time) by part company.</td>
<td>51</td>
<td>—</td>
<td>14</td>
<td>35</td>
</tr>
<tr>
<td>Parts by which part company has patent (%)</td>
<td>8</td>
<td>—</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Parts made Black Box (%)</td>
<td>62</td>
<td>—</td>
<td>16</td>
<td>39</td>
</tr>
<tr>
<td>Parts that automaker designed (%)</td>
<td>30</td>
<td>—</td>
<td>81</td>
<td>54</td>
</tr>
<tr>
<td>Relation to manufacturer ④:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of companies of parts for each assembly hall.</td>
<td>170</td>
<td>238</td>
<td>509</td>
<td>442</td>
</tr>
<tr>
<td>Stock level (eight sample parts on day).</td>
<td>0.2</td>
<td>1.6</td>
<td>2.9</td>
<td>2.0</td>
</tr>
<tr>
<td>Proportions of parts delivered by just-in-time (%)</td>
<td>45.0</td>
<td>35.4</td>
<td>14.8</td>
<td>7.9</td>
</tr>
<tr>
<td>Ratio of parts delivered alone (%)</td>
<td>12.1</td>
<td>98.0</td>
<td>69.3</td>
<td>32.9</td>
</tr>
</tbody>
</table>

Purchasing Market Research

Research on candidates of suppliers
overall industry, by product, by supplier

To what extent does suppliers’ side present information?
Mutual trust promotes information sharing.

new products exhibition, global design competition,
benchmarking (reverse engineering),
individual business meeting, purchasing market research
Selection of Supplier (competition among suppliers)

Purchase at stores (ready-made product)

Bidding

Unconstraint contract:
selection by judgment of person in charge of purchasing
(e.g., development competition)
# Design Outsourcing System and Competition Pattern

(1) Case of model change (N=201)

<table>
<thead>
<tr>
<th>Competition pattern</th>
<th>Loan drawing method</th>
<th>Approved drawing method</th>
<th>Ready-made product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bid</td>
<td>45%</td>
<td>9%</td>
<td>8%</td>
</tr>
<tr>
<td>Development competition</td>
<td>5%</td>
<td>49%</td>
<td>33%</td>
</tr>
<tr>
<td>Nominated contract for one company</td>
<td>48%</td>
<td>48%</td>
<td>42%</td>
</tr>
<tr>
<td>Other</td>
<td>10%</td>
<td>5%</td>
<td>25%</td>
</tr>
<tr>
<td>Total</td>
<td>* (100%)</td>
<td>* (100%)</td>
<td>* (100%)</td>
</tr>
</tbody>
</table>

* : Total does not accord with 100% due to multiple answers.

(2) Case of new model (N=201)

<table>
<thead>
<tr>
<th>Competition pattern</th>
<th>Loan drawing method</th>
<th>Approved drawing method</th>
<th>Ready-made product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bid</td>
<td>53%</td>
<td>11%</td>
<td>0%</td>
</tr>
<tr>
<td>Development competition</td>
<td>7%</td>
<td>64%</td>
<td>50%</td>
</tr>
<tr>
<td>Nominated contract for one company</td>
<td>38%</td>
<td>31%</td>
<td>33%</td>
</tr>
<tr>
<td>Other</td>
<td>10%</td>
<td>6%</td>
<td>25%</td>
</tr>
<tr>
<td>Total</td>
<td>* (100%)</td>
<td>* (100%)</td>
<td>* (100%)</td>
</tr>
</tbody>
</table>

* : Total does not accord with 100% due to multiple answers.

Takahiro Fujimoto 'Theory of Evolution of Production System' Yuhikaku Publishing Co., Ltd.
Multiple-Sourcing or Single-Sourcing? (case of automobile)

Design of individual part —— single sourcing being majority as many orders include design

Part category ——— multi sourcing being majority to secure potential competitive pressure
Procurement Status of Electronic Control Fuel Injector by Auto Maker

Note: In parenthesis are estimated shares (%).

Produced from information in newspapers and others.

- Toyota Motor Corporation
- Nissan Motor
- Honda Motor
- Mazda Motor Corporation
- Mitsubishi Motors Corporation
- Daihatsu Motor
- Suzuki Motor
- Fuji Heavy Industries
- Isuzu Motors

Nippondenso (53)
日本電子機器 (25)
Hitachi (3)電子技研 (12)
Mitsubishi Electric Corporation (7)

‡

Mikio Matsui 'Automobile Parts' Nihon Keizai Shimbun, Inc.

Figure removed
due to copyright restrictions
Parts Supplier Dispersity of Japanese Auto Makers

2.22 companies
2.18 companies

Notes: ① Dispersity: average parts suppliers per variety per auto maker
② Average quantity in category of major parts (250) traded with 9 auto makers (Toyota, Nissan, Mitsubishi Motors, Mazda, Honda, Isuzu, Daihatsu, Fuji HI, Suzuki)

Reference: produced from data of Japan Automobile Manufacturers Assosiation, Inc.
Mikio Matsui 'Automobile Parts' Nihon Keizai Shimbun, Inc.

Figure removed
due to copyright restrictions
Criteria on Supplier Selection

Long term/ multidimensional evaluation?

Bargaining based on negotiation power?

---- Knowledge on ordering side, capability on joint problem solving being questioned
Purchasing Contract

In Japan, many are in two steps.

Basic contract — base for continuous business

Individual contract — individual order
(two specify product code, quantity, delivery)

Purchasing procedure (document)

purchase request → request for estimate → estimate → order sheet
→ confirmation of receiving order (contract established)
→ delivery note, etc. (delivery) → check sheet, etc. (receiving inspection)
→ bill

Computerizing commercial trade information — EDI (electronic data exchange)

Closed type EDI (own format)
Open type EDI (standardization of transmission rule in industry)
CALS (between companies including design information)
<table>
<thead>
<tr>
<th>Section</th>
<th>Article</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Basic principle</td>
<td>basic contract and individual contract, content of individual contract, conclusion of individual contract, change of individual contract</td>
</tr>
<tr>
<td>2. Contract</td>
<td>provision of raw material, etc., receiving/other of provisioned material, owner ship of provisioned material, disposal of remains of provisioned material/other, loan of machine/mold/other, handling of provisioned material and loan article, decrease/loss/mutilation/other of provisioned /loan material/article</td>
</tr>
<tr>
<td>3. Order</td>
<td>order, unit</td>
</tr>
<tr>
<td>4. Provision / Loan</td>
<td>delivery date, change in delivery date</td>
</tr>
<tr>
<td>5. Time of delivery</td>
<td>delivery/inspection/hand–over, delivery of shortage or substitute, take back of failures or over–delivery, discounting operation, ownership transfer of subject article</td>
</tr>
<tr>
<td>6. Delivery</td>
<td>due date, method of payment, setoff</td>
</tr>
<tr>
<td>7. Payment</td>
<td>management of drawing, etc., risk bearing, defect liability, industrial property right, prohibition on making/sale, confidentiality, repeat order, disposition of rights/obligations</td>
</tr>
<tr>
<td>8. General information</td>
<td>announcement on business suspension, reporting requirements</td>
</tr>
<tr>
<td>9. Announcement / notice</td>
<td>contract termination, measures after termination of contract, claim for damage, remaining duties</td>
</tr>
<tr>
<td>10. Annulment of contract</td>
<td>solution through discussion</td>
</tr>
<tr>
<td>11. Effective period</td>
<td>effective period</td>
</tr>
</tbody>
</table>

Reference: Tsukasa Shimazu
Figure removed
due to copyright restrictions
3. Purchasing Cycle and Its Management (after volume production)

Purchasing cost management

Estimate of appropriate price

  market price
  comparison with precedent
  intuition and experience (buyer’s skill)
  buildup of manufacturing cost
  functional price analysis (price to match function: reasoning)

Opportunistic bargaining renders negative effect in long run.

Cost planning, cost improvement to be done in corporation with supplier
Delivery Management in Purchasing (press)

(1) Order in appropriate timing
(2) Progress management and press after ordering
   Progress management, MRP, Kanban, etc.

Cause of delivery delay
   --- ordering side; receiving side; failure in coordination

Purchasing Volume Management

Material requirement plan (MRP)
   (reference chapters on process management, inventory management)
Logistics/Warehouse Management

Selection of transportation means (truck, railway, ship, airplane)
Selection of hand out condition

  FOB auto maker (truck arranged by parts maker)
  FOB parts maker (truck arranged by auto maker)

Mixed -loading method

Design of Warehouse Network

  Warehouse dispersion --- low speed and cheap transportation mode?
  (high inventory cost)

  Warehouse concentration --- high speed and expensive transportation mode?
  (high transportation cost)

  Inbetween format?
Purchasing Quality Control

Extension of inter-company quality control

(1) reinforcement of receiving inspection

(2) delivery without inspection ("building quality into product")

Defect found in receiving inspection --- claim for damage

Defect not found in inspection --- liability for defect warranty
3. Purchasing Management and Competitiveness : Case of Automobile

Purchasing cost of material/parts occupying majority of manufacturing cost (70%, 80% in automobile)

Competitiveness of Japanese manufacturing industries has being supported by the supplier system.
“3 Devine Treasures” of Supplier System in Japanese Automobile Industry

(1) Continuous trading for long term

(2) Capability-building competition among limited number of suppliers

(3) “Leave things in bundle” (division of labor in batch ordering model)

These three contribute to the automobile industry in a mutually complementary form.

(Fujimoto/ Nishiguchi /Suzuki edition “Supplier System” Yuhikaku)