My Experiences with China: A Logistics Research Perspective

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Outline

- Introduction
- A Case Study
  - Pratt & Whitney and Chengdu Aerotech, Global Logistics System Effectiveness (2000-2001)
- A Plant Tour
  - China First Automobile Group Corp. (Summer, 2004)
- Discussions and Conclusions

1. Introduction

- My Research Interests
  - Efficient strategies, decisions & methods for supply & distribution networks
  - Global logistics and supply chain process design and management
  - Outsourcing strategies to China
- Research Collaboration with Chinese Universities
  - *Sea-Sky Scholar*, School of Management, Dalian University of Technology, June ’05 – June ‘08
    - Logistics research
    - Logistics education
  - *Guest Research Scholar*, School of Economics & Management, Southeast University, Sept. ’04 – present
    - Global procurement strategies, and dynamic pricing decisions and methods in global e-commerce environment
    - Business models and operations strategies for logistical services in China

2. A Case Study (2000 – 2001)

- The project was supported by APICS – the E&R Foundation, Supply Chain Council, Pratt & Whitney, and Chengdu Aerotech

- Major Publications:

1. Zeng, A. Z. and Rossetti, C. (2003), "Developing a Framework for Evaluating Logistics Cost in Global Sourcing Processes: An Implementation and Insights, " International Journal of Physical Distribution and Logistics Management, Vol. 33, No. 9, 785-803. This article will be reprinted in Global Supply Chain Management, edited by Masaaki Kotabe and Michael J. Mol, Edward Elgar Publishing Ltd., UK, 2005.

2. Zeng, A. Z. (2003), "Global Sourcing: Process and Design for Efficient Management," Supply Chain Management: An International Journal, Vol. 8, No. 4, 367-379.

3. Zeng, A. Z. (2002), "An Optimization Framework for Evaluating Logistics Costs in Global Supply Chains: An Application to the Commercial Aviation Industry," Chapter 12 in Supply Chain Management: Models, Applications and Research Directions, edited by J. Genues, P. Pardalos and H.E. Romeijn, Kluwer Academic Publishers, ISBN No. 1-4020-0487-7, pp. 317-341.

4. Zeng, A. Z., C. Rossetti, and K. Mair II (2001), "Managing Material and Information Flows in Global Supply Chains: A Bilateral Study," APICS-the Educational & Research Foundations Research Paper Series, Stock No. 07030.

Company Background

The Parent Company - Pratt & Whitney:

- A leader in the design, manufacture and support of engines for commercial, military and general aviation aircraft, and space propulsion systems
- Truly worldwide: representatives in 97 cities in 47 nations
- Partnerships and joint ventures have reached to Asia and Europe

The Joint Venture - Chengdu Aerotech:

- established in 1996 by three partners: Company P (50.5%); a local engine company (39.5%), and Aviation Authority of China (10.5%)
- formed as a world-class manufacturer of sheet metal fabrication
- divided into four manufacturing cells

Beijing

~ 1000km

Shanghai

~ 1000km

Hong Kong

~ 850km

Chengdu

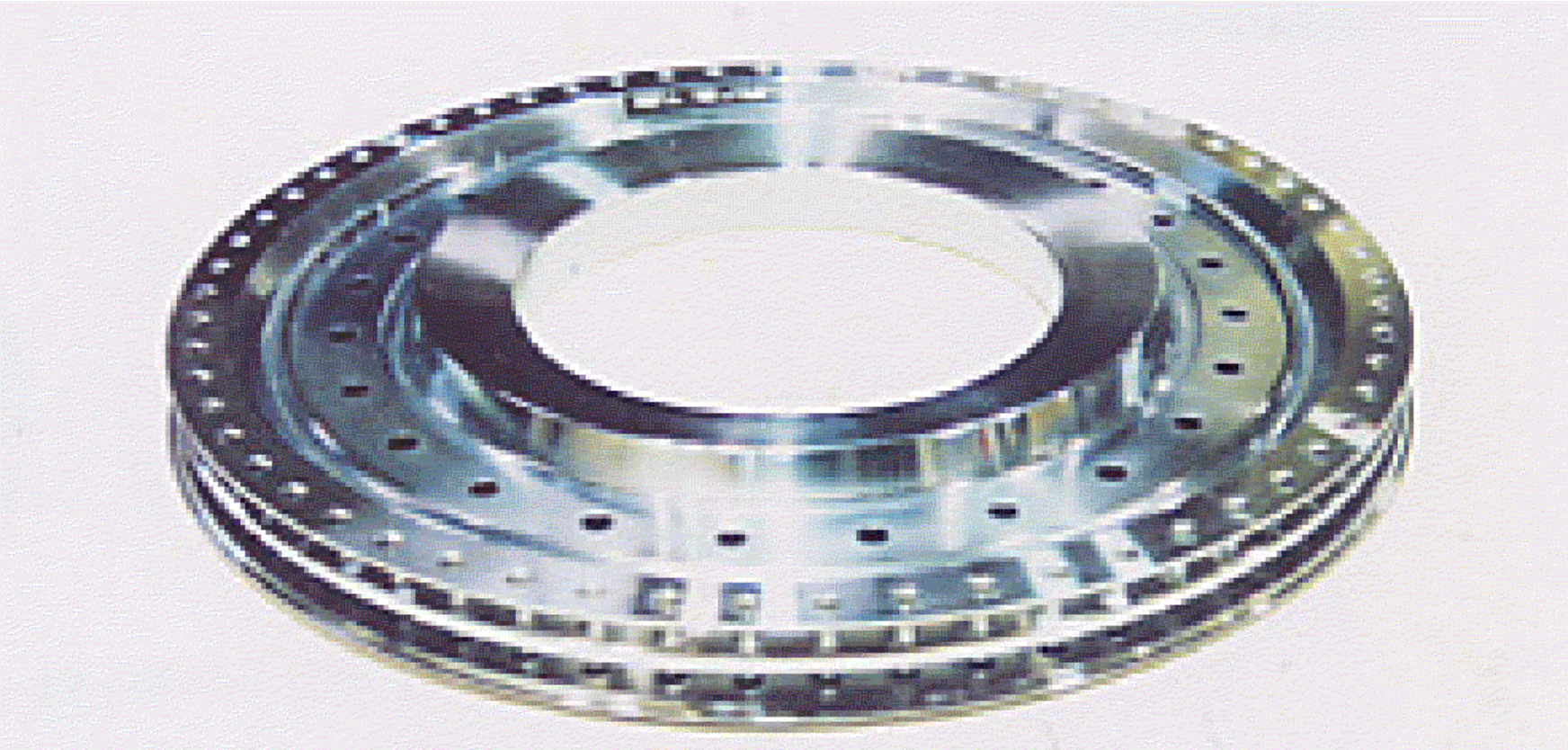
Characteristics of the Products

- **Major Parts Produced at the JV**

	Weight (kg)	Value ($/unit)	Volume (CBM)	Yearly demand
Pin Disk	35	5,000	0.061	1000
Burner Cans	24	1,300	0.172	1500
Shroud Assembly	33	15,000	0.192	400
Average/Total	29	7100	0.137	2900

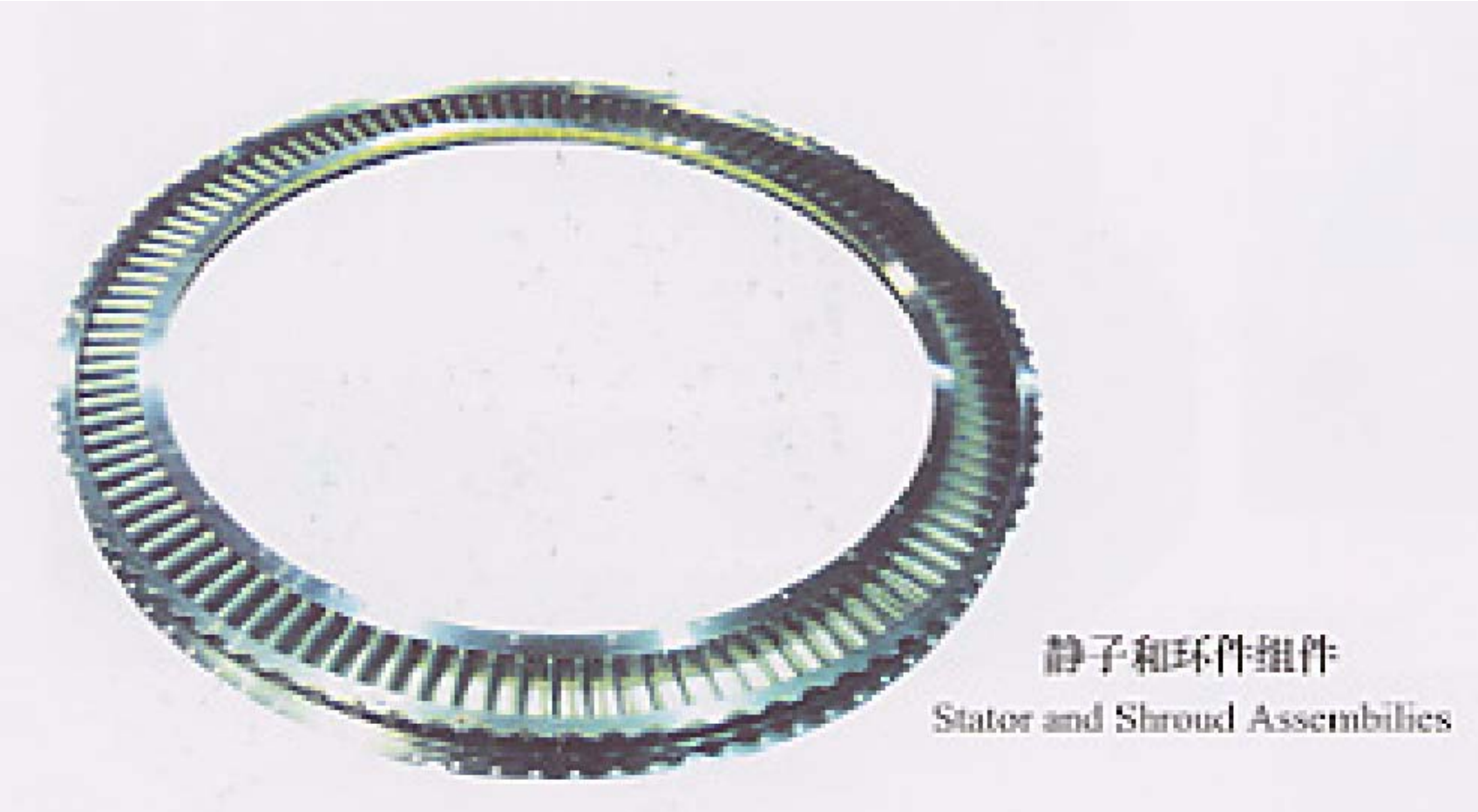
- **Quality of the Outsourced Parts**
  - Excellent at the end of production line
  - Problems primarily come from handling and shipping

JT8D Pin Disk

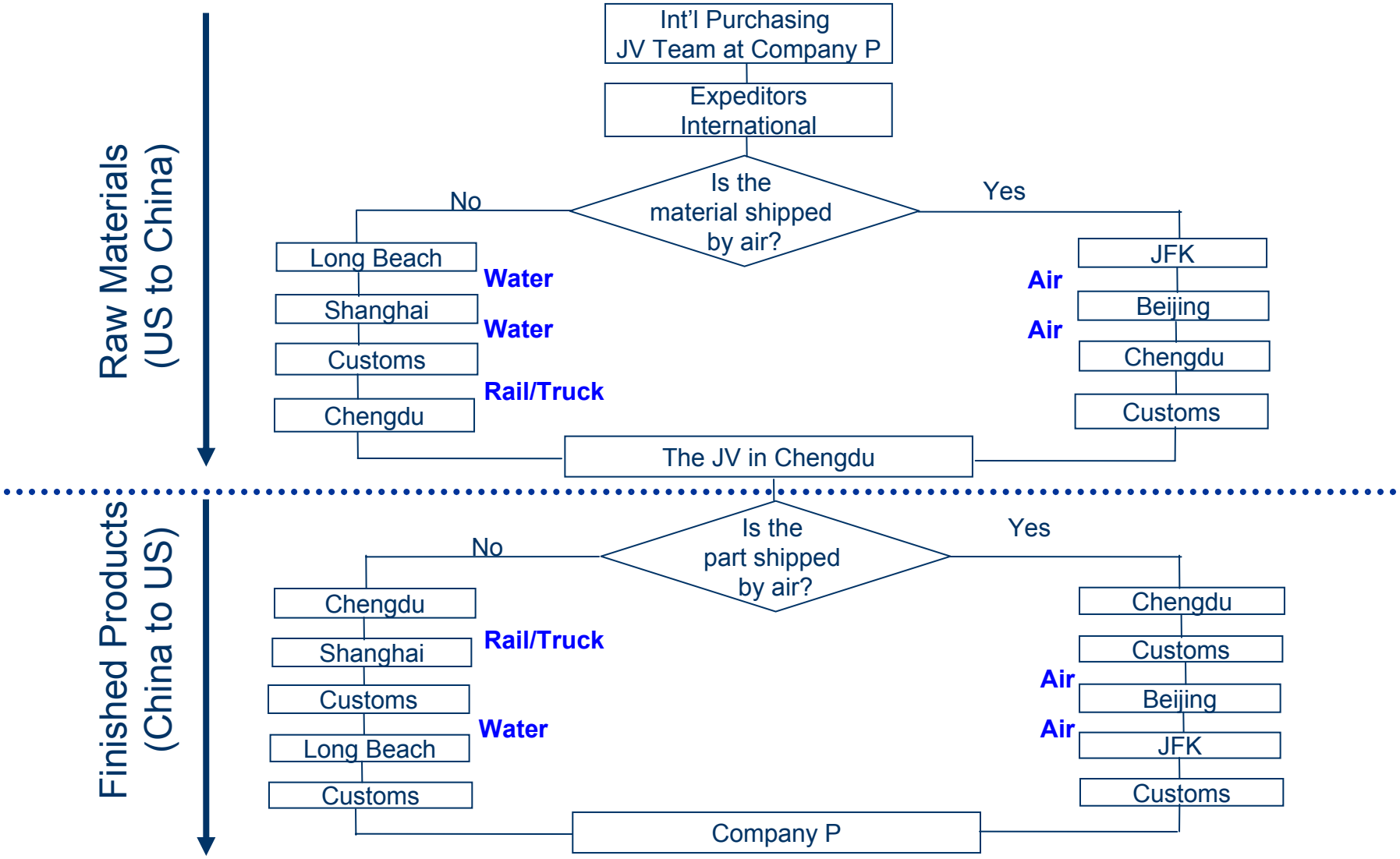


Burner Can

Stator and Shroud Assemblies



Transportation Route



Evaluating the Materials Flow Process

Three Major Criteria Are Developed:

(1) Process cycle time = manufacturing + delivery

- Manufacturing: 3 weeks for each batch order
- Delivery: an *event-based timing* approach

(2) Logistics cost

- Categorization and quantification
- An evaluation procedure

(3) Cost-to-value ratio

$$= \frac{\text{logistics cost per year}}{\text{value of (raw materials, added service, finished part)}}$$

Delivery Time of the Five Transportation Modes
(in days)

Alternatives	US to China		China to US	
	Time	Delay	Time	Delay
Air	9.25	5	9	6
W-R FCL	43.5	16.5	39	17.5
W-R LCL	50.5	18.5	46	19.5
W-K FCL	38	14.5	36	16
W-K LCL	45	16.5	41	18

Legend:

- W-R FCL: water-rail full container load
- W-R LCL: water-rail less container load
- W-K FCL: water-truck full container load
- W-K LCL: water-truck less container load

Logistics Cost Components

Total Logistics Cost Component

Customs Charges (C_c)
1. Customs clearance ($/shpmt)
2. Brokerage fee ($/shpmt)
3. Allocation fee ($/shpmt)

Risk Costs (C_r)
1. Damage/Loss/Delay (%/$)
2. Insurance (%/$)

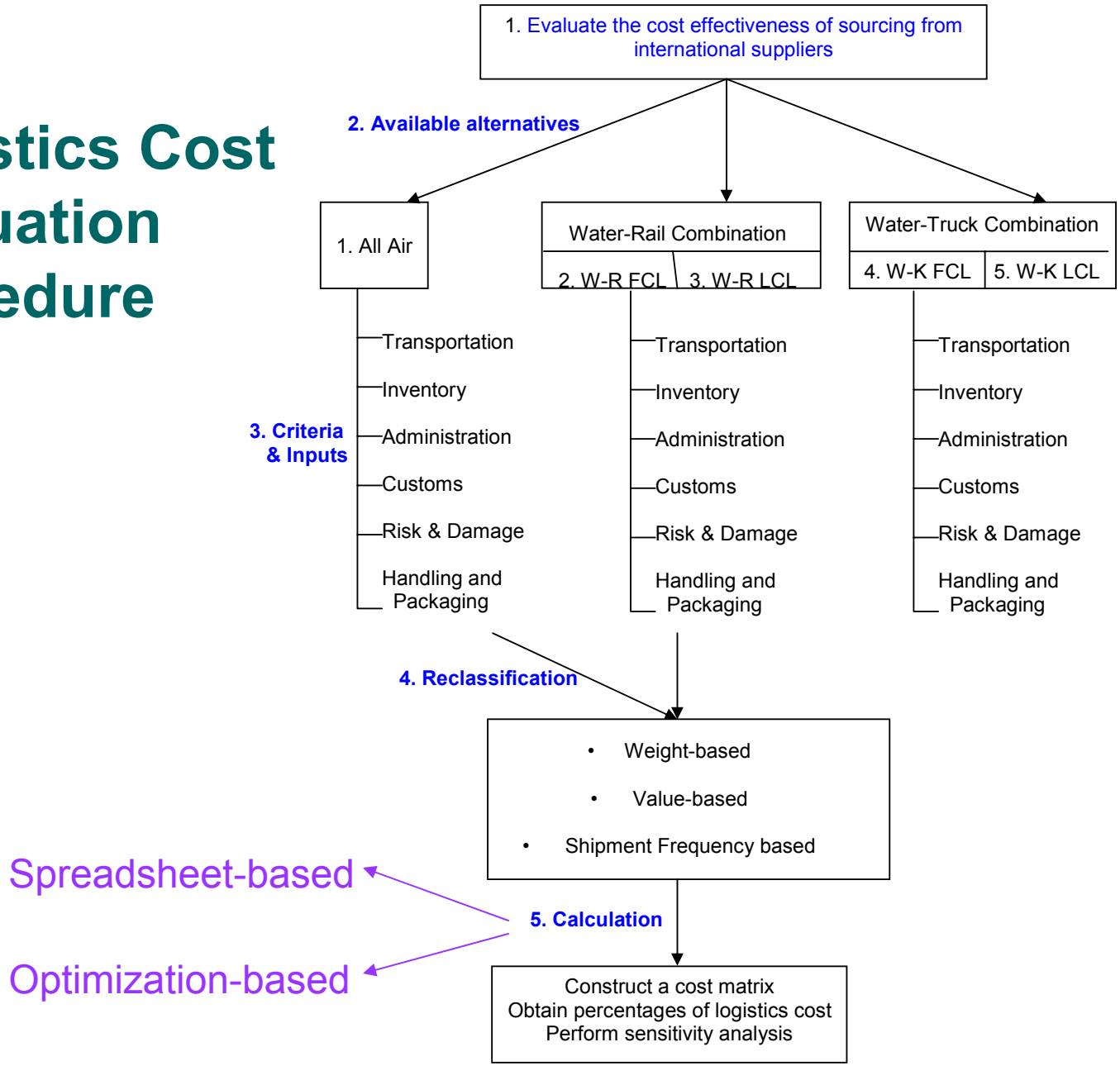
Inventory Holding Costs (C_h)
1. Pipeline inventory (%/$/yr)
2. Safety stock (%/$/yr)

Administration Costs (C_a)
1. Order processing ($/shpmt)
2. Communication ($/shpmt)
3. Overhead ($/shpmt)

Handling & Packaging Costs (C_m)
1. Terminal handling cost ($/shpmt)
2. Material handling cost ($/shpmt)
3. In/out handling cost ($/shpmt)
4. Disposal charge ($/shpmt)
5. Packaging/supplies materials (%/$)
6. Storage cost ($/kg/day)

Transportation Costs (C_t)
1. Freight charge ($f(Q)$)
2. Consolidation charge ($g(Q)$)
3. Transfer fee ($/shpmt)
4. Pickup & Delivery charge ($/shpmt)

Logistics Cost Evaluation Procedure



Design Issues: Two Alternatives

- **Vendor Required Material (VRM) Structure**

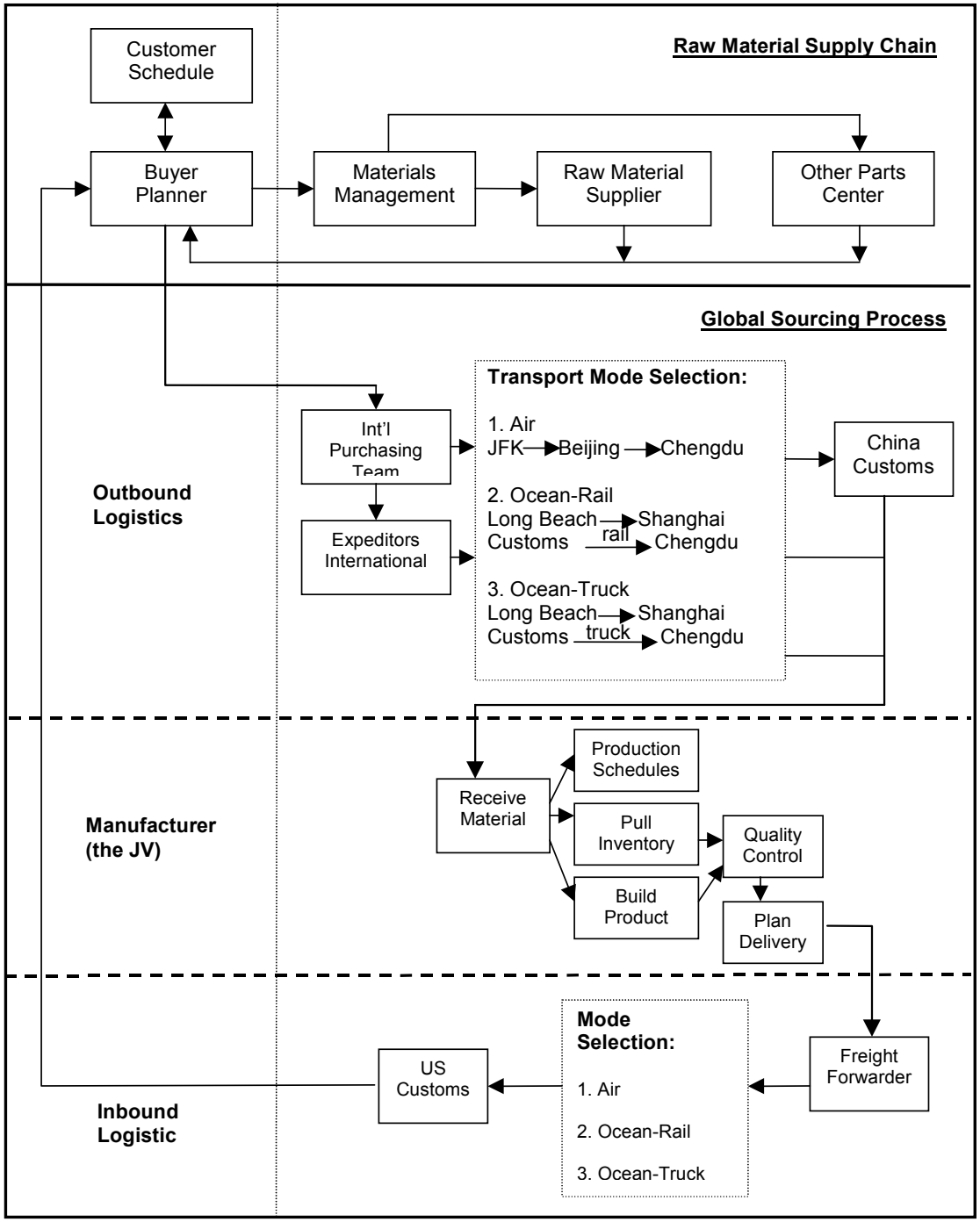
P&W purchases and supplies the raw material for JV. P&W is also financially responsible for shipping the material to JV. JV then performs its machining operations on the raw material and bills P&W for the value-added service.

- **Vendor Supplied Material (VSM) Structure**

JV procures its own raw materials and consumables and uses these items to produce a final product. The selling cost of the product incorporates all the costs to the company, including transportation costs for the raw material, and the desired mark-up for the finished goods.

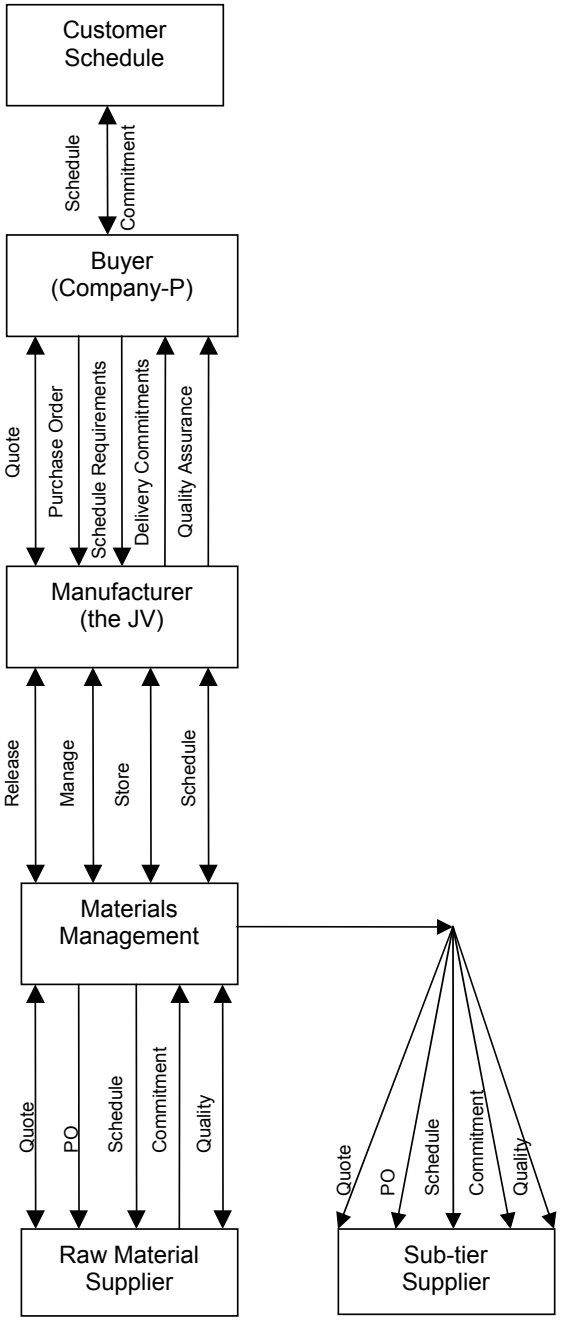
VRM

Vendor Required Material Structure



VSM

Vendor Supplied Material Structure



Advantages and Challenges

	Advantages		Challenges	
	Company P	**JV**	**Company P**	**JV**
VRM Structure	• Has full control • Easy to make changes • Highest degree of independence	• Less financial responsibility • Focus on production planning & scheduling	• Responsible for all critical decisions • Substantial financial burden	• Slow response from Company P due to no communication w/ suppliers • Difficult production planning & scheduling
VSM Structure	• Focus on coordination • Focus on strategic planning • Less involvement in production & distribution	• Smoother production and resource planning • More flexibility & communication with suppliers	• Increased responsibility for coordinating the entire supply chain • More investment in administrative functions • More currency risk	• IT technology must catch up to improve the speed of communication • Cooperate with both the parent company & suppliers

Assessment of Integration

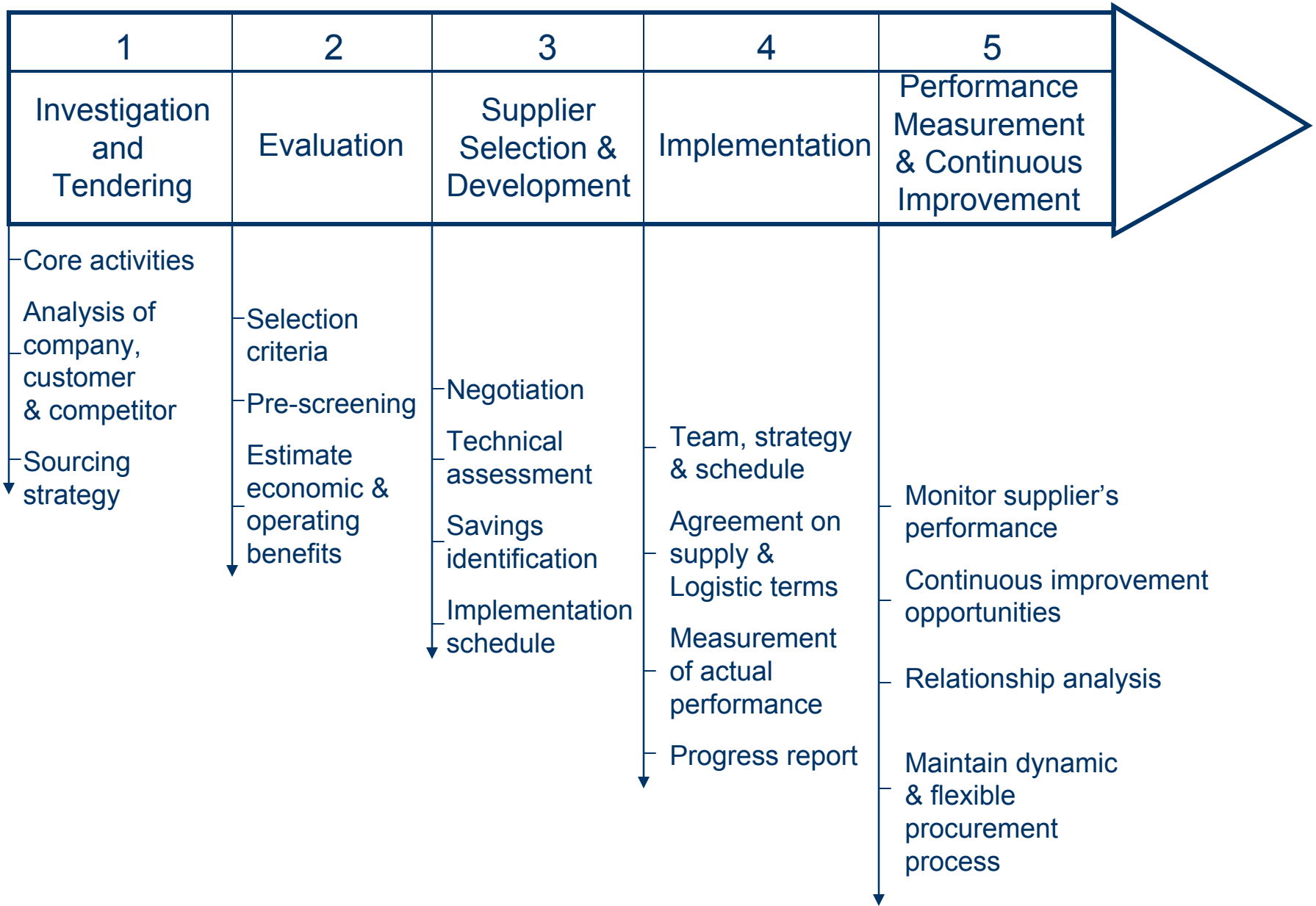
Dimensions of Supply Chain Integration		VRM Structure	VSM Structure
Information Integration	1. Information Sharing	Poor	Good
	2. Collaborative Planning	Poor	Good
	3. Forecasting	Good	Fair
	4. Replenishment	Poor	Good
Coordination	5. Decision Delegation	Poor	Good
	6. Work Alignment	Poor	Good
	7. Resource Allocation	Fair	Good
Organizational Linkage	8. Channels of Communication	Poor	Good
	9. Distribution of Accountability	Poor	Fair
	10. Monitor of Performance	Good	Fair

Lee, H. L. (2000), "Creating Value through Supply Chain Integration," *Supply Chain Management Review*, September/October Issue.

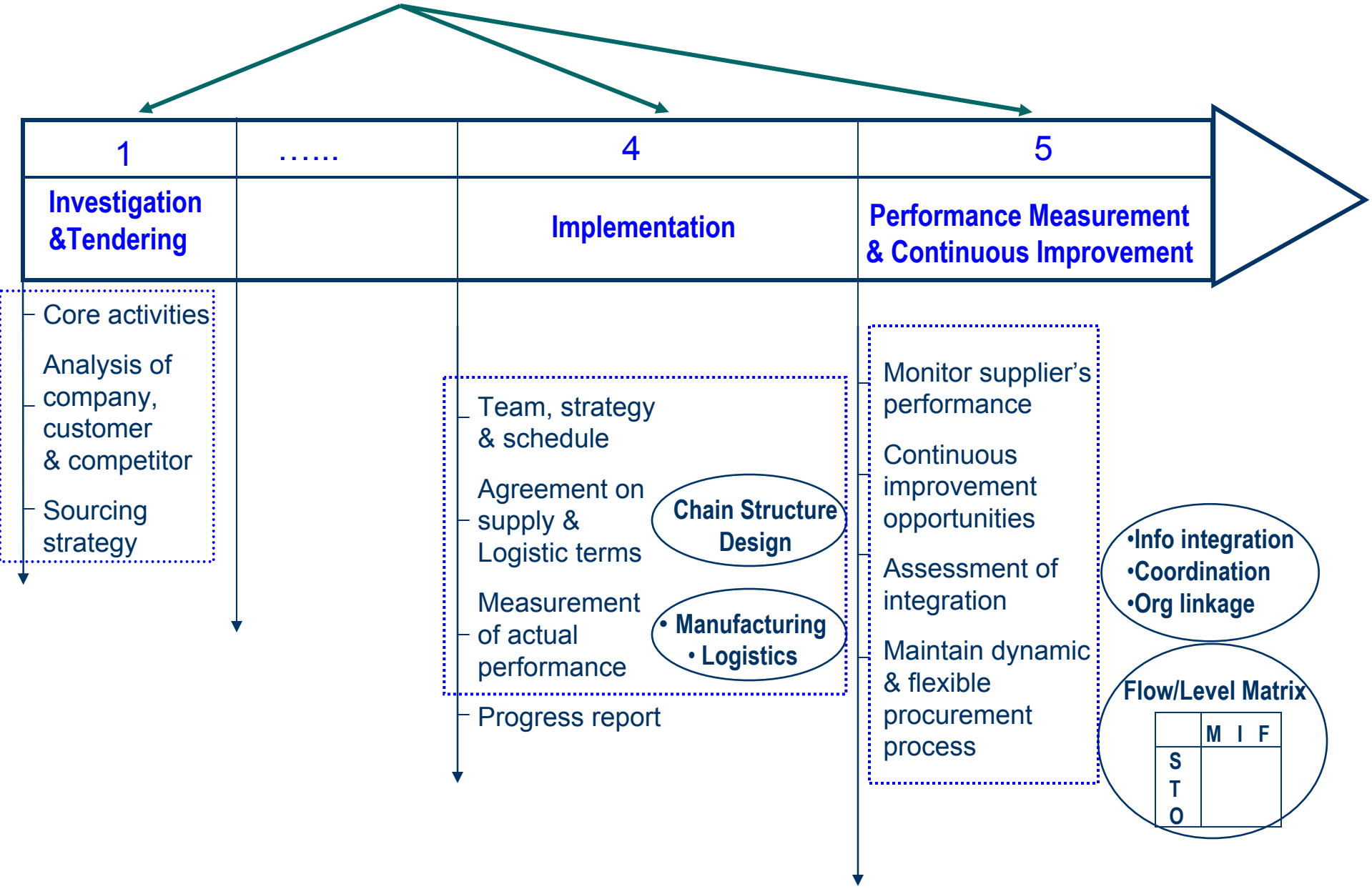
Classification of Management Issues

Flow / Mgt Level	Material	Information	Cash
Strategic	(1) Who controls the movement of the goods?	(1) Is the Information Technology (IT) Department at the global supplier sufficiently staffed?	(1) Who is responsible for paying the raw materials and transportation?
Tactical	(1) What are the MRP schedules? (2) What are the procedures at the customs? (3) What is the best transportation mode? (4) Who should be responsible for transportation?	(1) How is information transferred between the trading partners? (2) What is the IT infrastructure at the global supplier? (3) What is the suitable format for storing information?	(1) What is the payment cycle? Should it be the same as the delivery cycle?
Operational	(1) What are the packaging and material handling procedures and policies? (2) How are inventories controlled? (3) How to determine the purchasing cycle?	(1) Are the IT components adequate to ensure timely information transfer? (2) Is the IT personnel sufficiently trained?	(1) How to analyze the impact of exchange rate? (2) What is the form of fund transfer?

Outsourcing Process



Future Research



3. A Plant Tour (Summer 2004)

- China's First Automobile Group Corp. (originally First Automobile Works, FAW)
  - An Overview
  - FAW Import & Export Corp.
  - FAW-Volkswagen
  - Logistics Development

FAW 中国第一汽车集团公司 CHINA FAW GROUP CORPORATION

An Overview of FAW (1 of 3)

- Broke ground on July 15, 1953 and started China's automobile industry
- Headquartered in China's northeastern hinterland in the city of Changchun, Jilin Province

An Overview of FAW (2 of 3)

- Three important milestones:
  - Trucks only → light-duty trucks and cars
  - In 1991, established joint venture with Volkswagen
  - In 2002, began cooperation with Toyota Motor Corp.
- FAW now has 30 wholly owned subsidiaries and 15 subsidiary companies
- FAW factories and research institutes are located in 19 regions in 31 provinces, cities, and autonomous regions, which are mainly in northeastern and southwestern China
- In 2003, the company's total assets were valued at ¥106.2 billion, and the firm employed 124,000 employees

Key Financial Data of FAW (3 of 3)

Year	2003	2002
Sales of Vehicle (unit) Sales Income (100 million yuan)	902,329 1,140	580,356 845.10
Categorized Product Sales		
Cars	568,463	248,090
Heavy-duty Trucks	95,336	118,985
Mid-sized Trucks	66,742	81,734
Large-Medium-duty buses	1,429	1,718
Light-duty Trucks	59,883	41,776
Vans	12,465	17,742
Mini Buses	91,880	70,321
Mini Trucks	6,131	-
Profit Info		
Profit & Tax (100 million yuan) Profit (100 million yuan)	141.30 58.00	95.55 43.03

Source: FAW 2003 Annual Report

FAW Import & Export Corp. (FAWIEC)

- Established in 1984 as FAW's wholly-owned subsidiary
- Key Businesses
  - International marketing: export of CBUs
  - International marketing: export of components & parts
  - International purchasing
  - International cooperation
  - International bidding
  - Development of logistics services

FAWIEC's Financial Summary

	2003	2002
Total I/E Volume	$1,545.4 million	$338.9 million
Import Volume	1,486.8	270.0
Export Volume	58.6	68.9
Sales Income	1,512.9	335.5
Profits	14.1	3.9

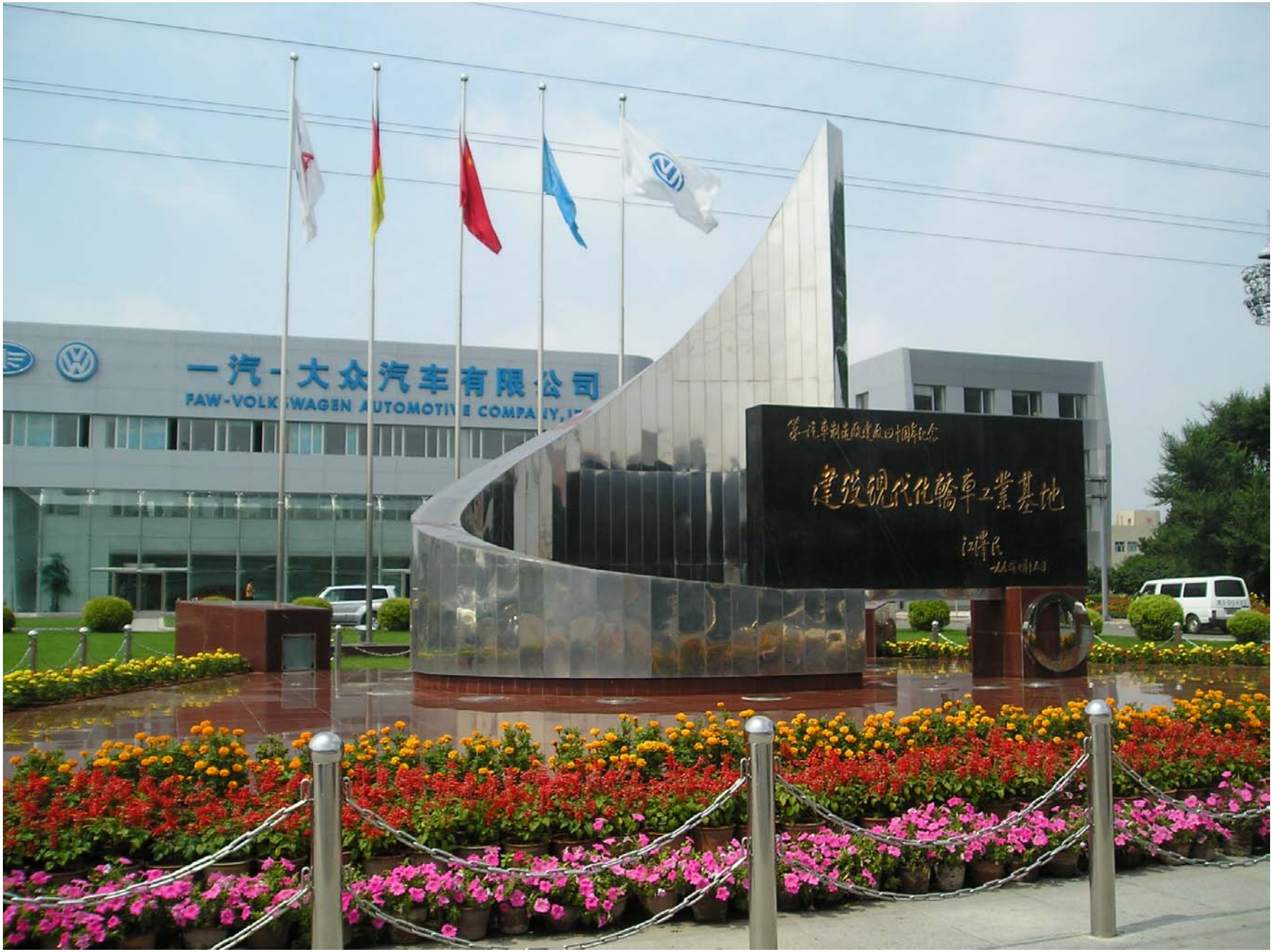
Source: 2003 FAWIE Annual Report

FAW-Volkswagen Automobile Co., Ltd

- A large-scale joint venture passenger car manufacturer
- Established in 1991, with the first Jetta automobile rolling off the assembly line on December 5 of that year. Audi AG became a member of the partnership in 1995, and full scale production commenced in July of 1996.
- The company covers an area of 1.16 million square meters with a total investment of 11.13 billion Yuan and registered capital of 3.71 billion Yuan.
- Following 10 years of continuous construction and development, the product offerings of FAW-Volkswagen have extended from the Jetta sedan to include the Bora (Jetta in U.S.), Golf, Audi A4, and A6. Production capability has reached an annual output level of 330,000 vehicles, 300,000 engines, and 180,000 transmissions.

FAW-Volkswagen (cont'd)

- On July 1, 2003, the board of directors of FAW-VW Automobile Co., Ltd. approved the construction of FAW-Volkswagen's Plant II, while simultaneously increasing the total investment from 11.13 billion Yuan to 23.435 billion Yuan (US $2.8 billion) with a registered capital increase from 3.71 billion Yuan to 7.812 billion Yuan (US $945 million). At present, 350,000 square meters of Plant II's 660,000 square meter design has been completed.
- Plant II will consist of 4 production areas, including stamping, welding and sub-assembly, painting and sub-assembly, and final assembly. Production will be focused on new PQ35 platform which includes the Bora V, Golf V, and recently announced Caddy MPV. The first Changchun-produced Caddy prototype was completed on July 1st of 2004, with pre-production commencing October 12, 2004.


一汽-大众汽车有限公司
FAW-VOLKSWAGEN AUTOMOTIVE COMPANY,
建設現代化輸車工業基地

次就把事情做对
Gleich richtig beim ersten Mal
QRK3

一 次 就 把 事 情 做 对
ch's gleich richtig beim ersten Mal
一班计划:315辆 一班完成:85辆
月计划:20730辆 月完成:16018辆
年累计: J85315辆 D47975辆
G9925辆 合计:143215辆

Logistics Development

- Changchun Supply Automobile Logistics Development Co., Ltd (CSALD)
  - Officially established in July 2003 as a JV
  - Adopted advanced global management techniques to provide SCM services and solutions for FAW and China's auto industry as a whole
  - To support FAW-VW Plant 2 operations
- Changchun FAW International Logistics Center
  - Wholly owned by FAWIEC
  - I/E cargos DC for FAW

一汽国际物流中心

Basic Statistics of FAW-ILC

- The center employs 172 people, including 24 managers
- The center occupies 220,000m^2, of which 10,000m^2 is the warehouse space
- The warehouse capacity is 100,000 TEUs per year
- The center owns 640m-long railway especially for containers shipment
- Followed ISO 9000 certification standards to establish and perfect quality management systems

FAW-ILC Services

- Integration of I/E materials and information flows
- Information center of I/E logistics services
- Logistics service provider (3PL)
- Supporting FAW's I/E businesses
- Developing logistics strategies and relationships
- Specific responsibilities
  - Cost reduction
  - Risk sharing
  - Supply chain management
  - Inventory reduction
  - Main resource consolidation and centralization
  - Customer service satisfaction improvement
  - Professional operations

Areas of Concerns/Interests

- 3PLs: the Present and Future
  - The development trend of American's 3PLs and 4PLs, and obstacles experienced in the development process
  - The role of 3PLs in supply chain design and commonly seen mistakes
  - The operating models of 3PLs and the key sources of profit
  - The differences between China's and America's 3PLs
  - The required skill sets of professional 3PL managers, and the training curriculum
  - A case study of the entire operational process at an American 3PL's distribution center for automotive industries

Areas of Concerns/Interests

- Applications of Technologies in Logistics
  - The commonly used technologies including IT in warehousing management and operating procedures in America's automotive supply chains
  - The current application of virtual reality to identifying logistical solution alternatives
- Regulations and Policies
  - What are the regulations available for warehousing related operations, including fire protection, personnel management, and environmental protection?
  - What are the standards and policies for Distribution Centers?

Discussions

- 3PL's International Networks: Key Focus
  - China coastal area infrastructure / operations: 11%
  - China inland infrastructure / operations: 10%
  - National Chinese infrastructure / operations: 6%
  - Intra-Asian routes: 10%
  - Outbound Asia-US routes: 16%
  - Outbound Asia-EU routes: 12%
  - Inbound US-Asia routes: 11%
  - Inbound EU-Asia routes: 8%
  - Overall international networks: 17%

Source: "3PLs' Views on the Logistics Landscape in China", eyefortransport, May 2005.

Challenges

- Present Key Challenges for the Logistics Industry
  - Government regulation: 48%
  - Quality of service: 43%
  - Transportation & logistics data tracking: 41%
  - Cargo security: 38%
  - Local knowledge / expertise: 36%
  - Ocean / Port capacity: 34%
  - Internal road and rail networks: 33%
  - Web-based operations / capabilities: 25%
  - Air capacity: 21%

Source: "3PLs' Views on the Logistics Landscape in China", eyefortransport, May 2005.

Future

- Key Challenges in the Next 5 Years
  - Government regulation: 47%
  - Quality of service: 37%
  - Internal road and rail networks: 37%
  - Transportation & logistics data tracking: 32%
  - Local knowledge / expertise: 27%
- Implications
  - Potential of China's operation is significant and the challenges are vast
  - Right decision and right knowledge are critical

Source: "3PLs' Views on the Logistics Landscape in China", eyefortransport, May 2005.

My Research Interests

- Operational Process of International 3PLs' Business in China
- Operating models and strategies appropriate for Chinese environment
- Service integration and knowledge transfer