

INTERNATIONAL DISTRIBUTION

- Frédéric Gauthier

Tools & Decisions in Supply
Chain

A 3D diagram illustrating a supply chain network. It features several white, ring-shaped nodes of varying sizes connected by thin, light blue lines. The nodes are arranged in a non-linear fashion, with some acting as central hubs and others as peripheral nodes. The entire network is set against a dark blue background with a subtle gradient and soft shadows on the nodes.

Part I- global supply chain

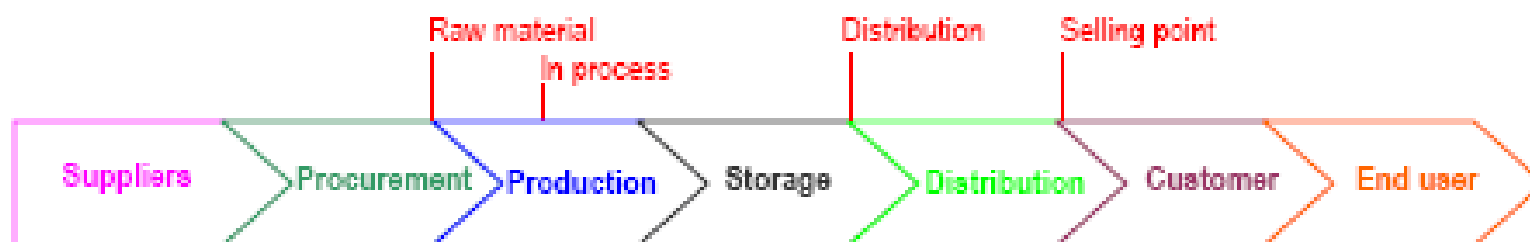
1- The bullwhip effect

2- From domestic to global supply chain

3- Vertical integration issues

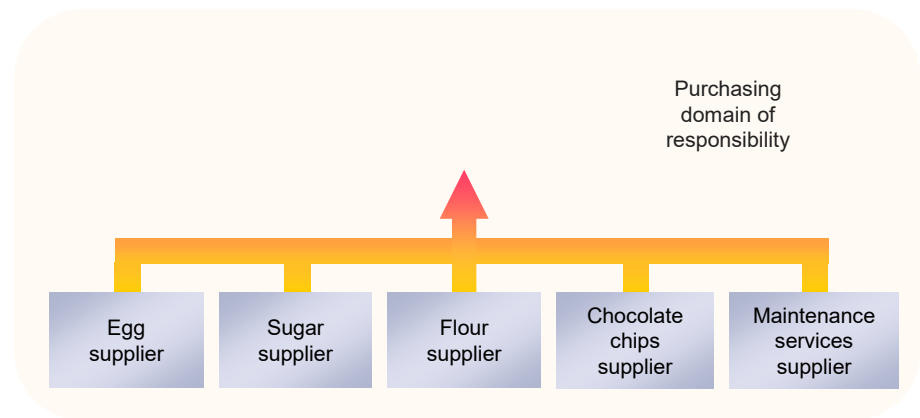
Introduction

Supply chain answers to
Geographic distances
Forecasting difficulties
Infrastructural inadequacies
Explosion products variety



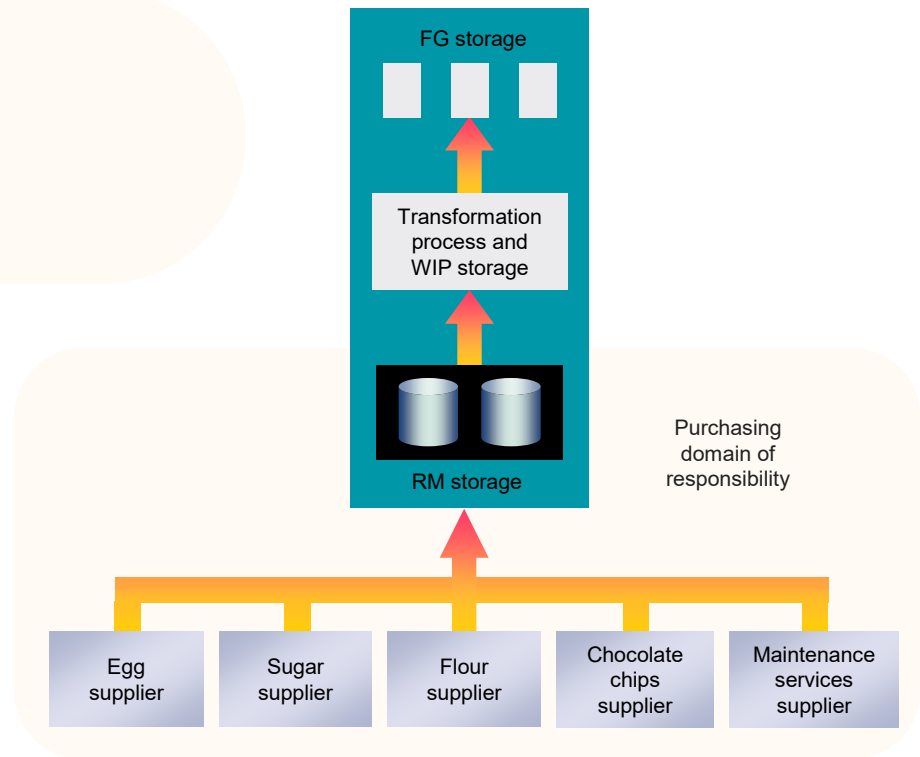
An example of a simple Supply Chain

Materials Management

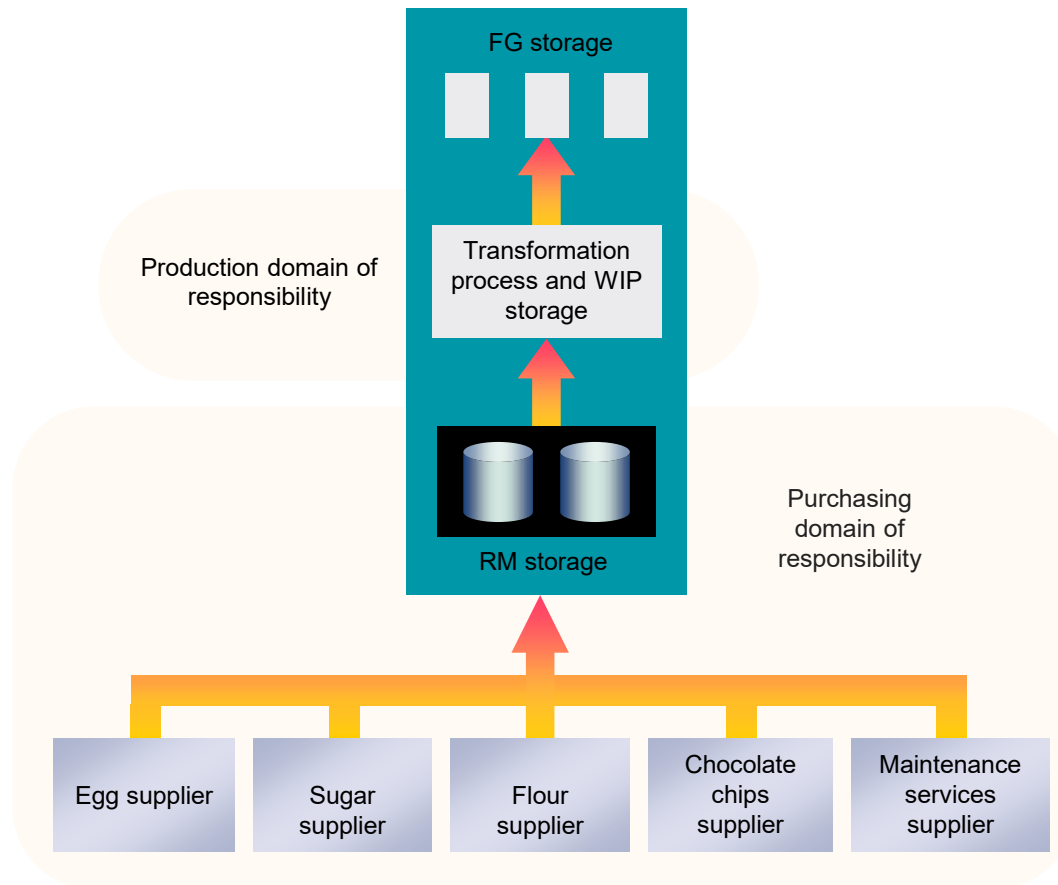


Materials Management

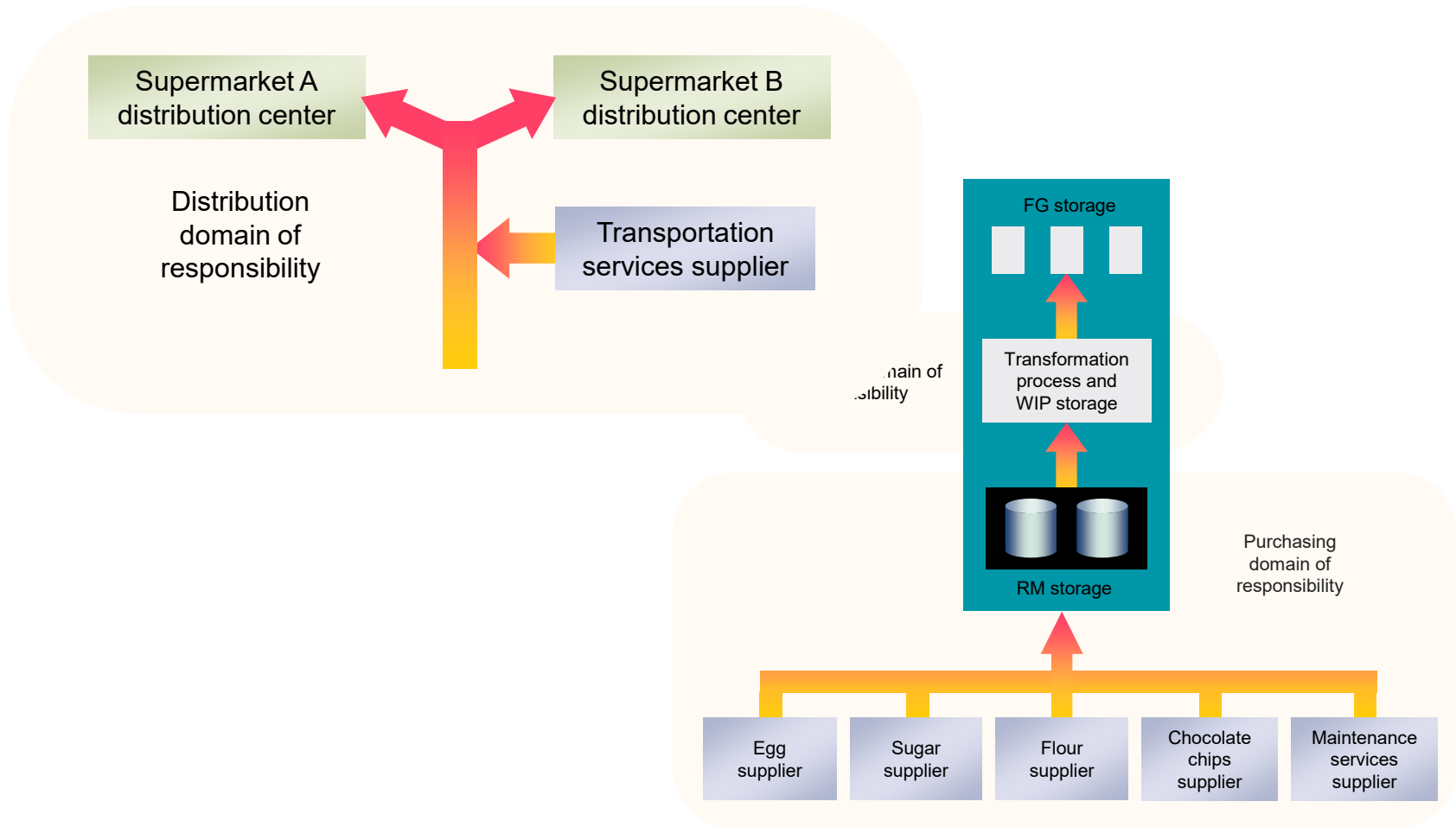
Production domain of responsibility



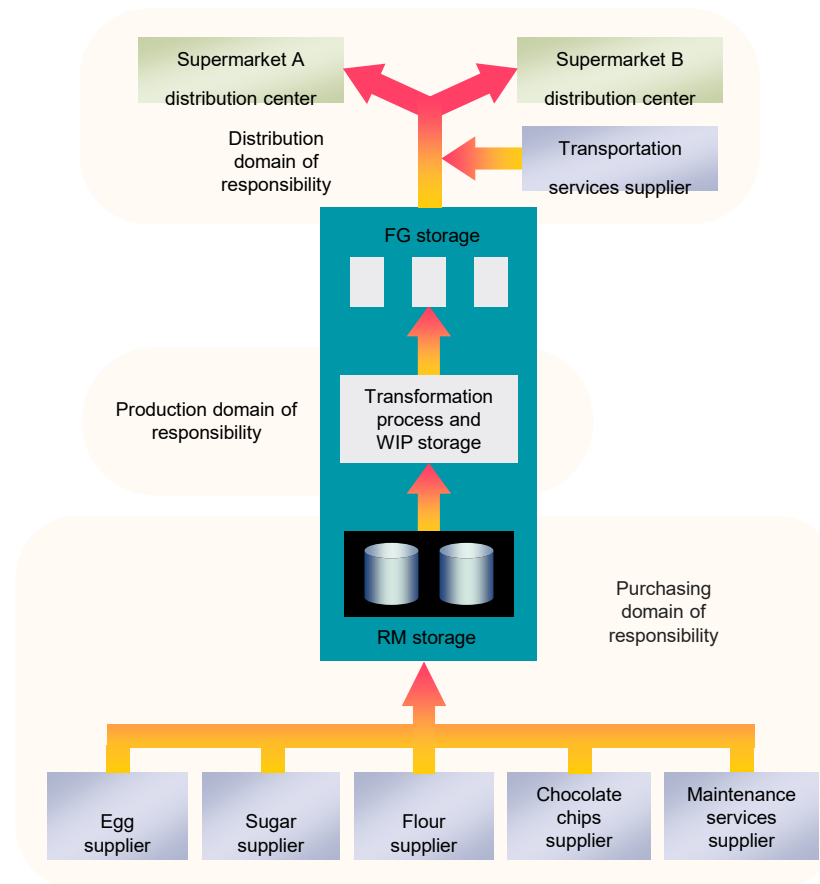
Materials Management



Materials Management



Materials Management



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1- Bullwhip effect

- Upstream channel
- Bullwhip effect when
- demand distortion
- Time and distance factors
- Bullwhip effect and its behavioral causes
 - Individual decisions, a threat of product shortage
 - Types of incentives, shortage cost
 - Lead time reduction as a solution
 - Order batching
 - Price fluctuation, price promotion
 - Rationing and shortage gaming

Bullwhip

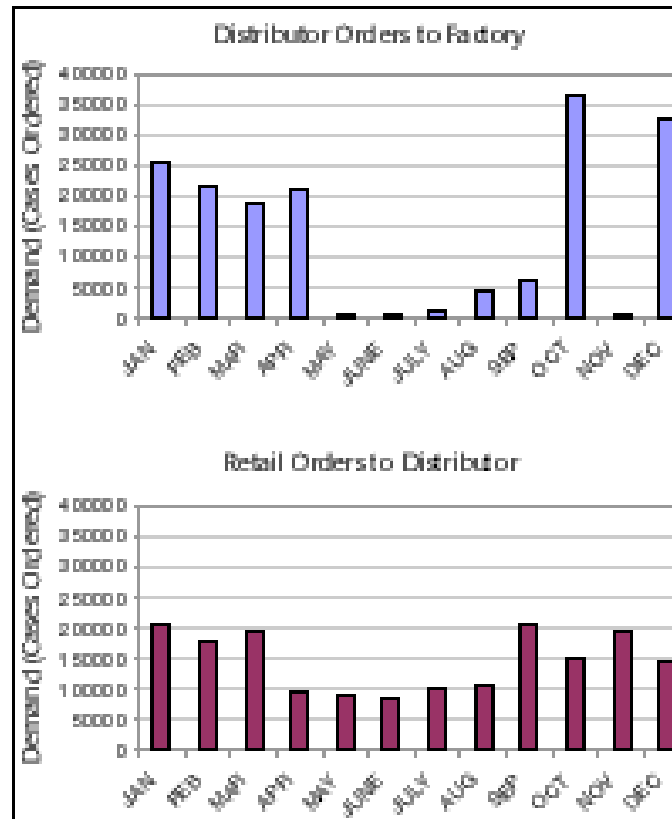
TABLE S11.1

The Bullwhip Effect

CAUSE	REMEDY
Demand forecast errors (cumulative uncertainty in the supply chain)	Share demand information throughout the supply chain.
Order batching (large, infrequent orders leading suppliers to order even larger amounts)	Channel coordination: Determine lot sizes as though the full supply chain was one company.
Price fluctuations (buying in advance of demand to take advantage of low prices, discounts, or sales)	Price stabilization (everyday low prices).
Shortage gaming (hoarding supplies for fear of a supply shortage)	Allocate orders based on past demand.

$$\text{Bullwhip} = \frac{\text{Variance of orders}}{\text{Variance of demand}} = \frac{\sigma_{\text{orders}}^2}{\sigma_{\text{demand}}^2} \quad (\text{S11-2})$$

Variance *amplification* (i.e., the bullwhip effect) is present if the bullwhip measure is greater than 1. This means the size of a company's orders fluctuate more than the size of its incoming demand. If the measure equals 1, then no amplification is present. A value less than 1 would imply a *smoothing* or *dampening* scenario as orders move up the supply chain toward suppliers.

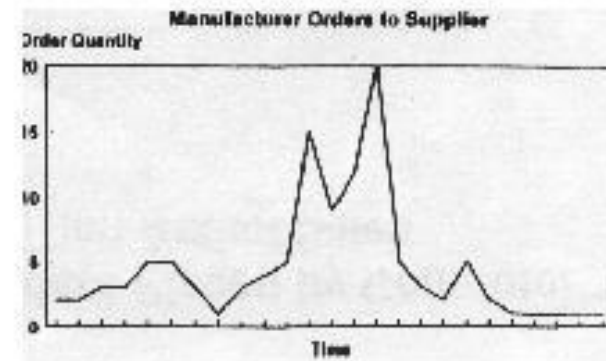
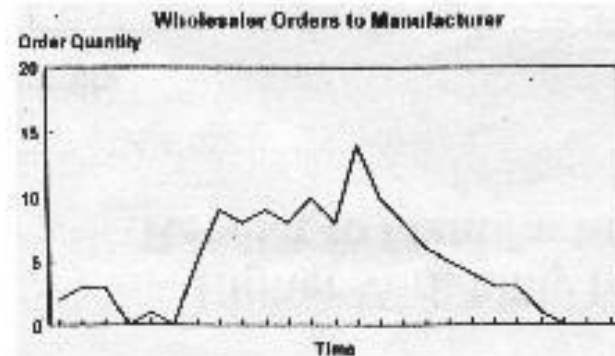
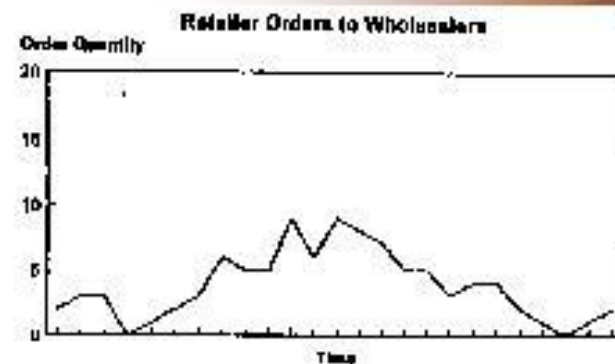
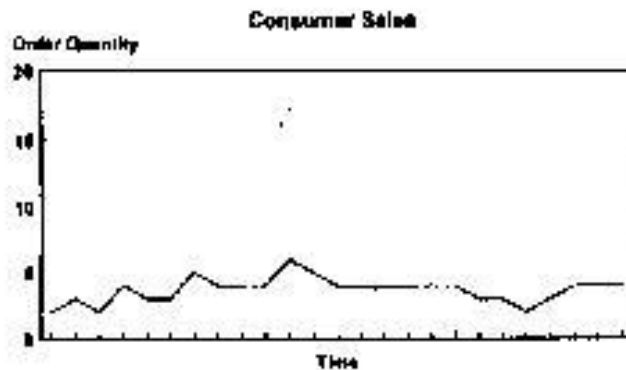


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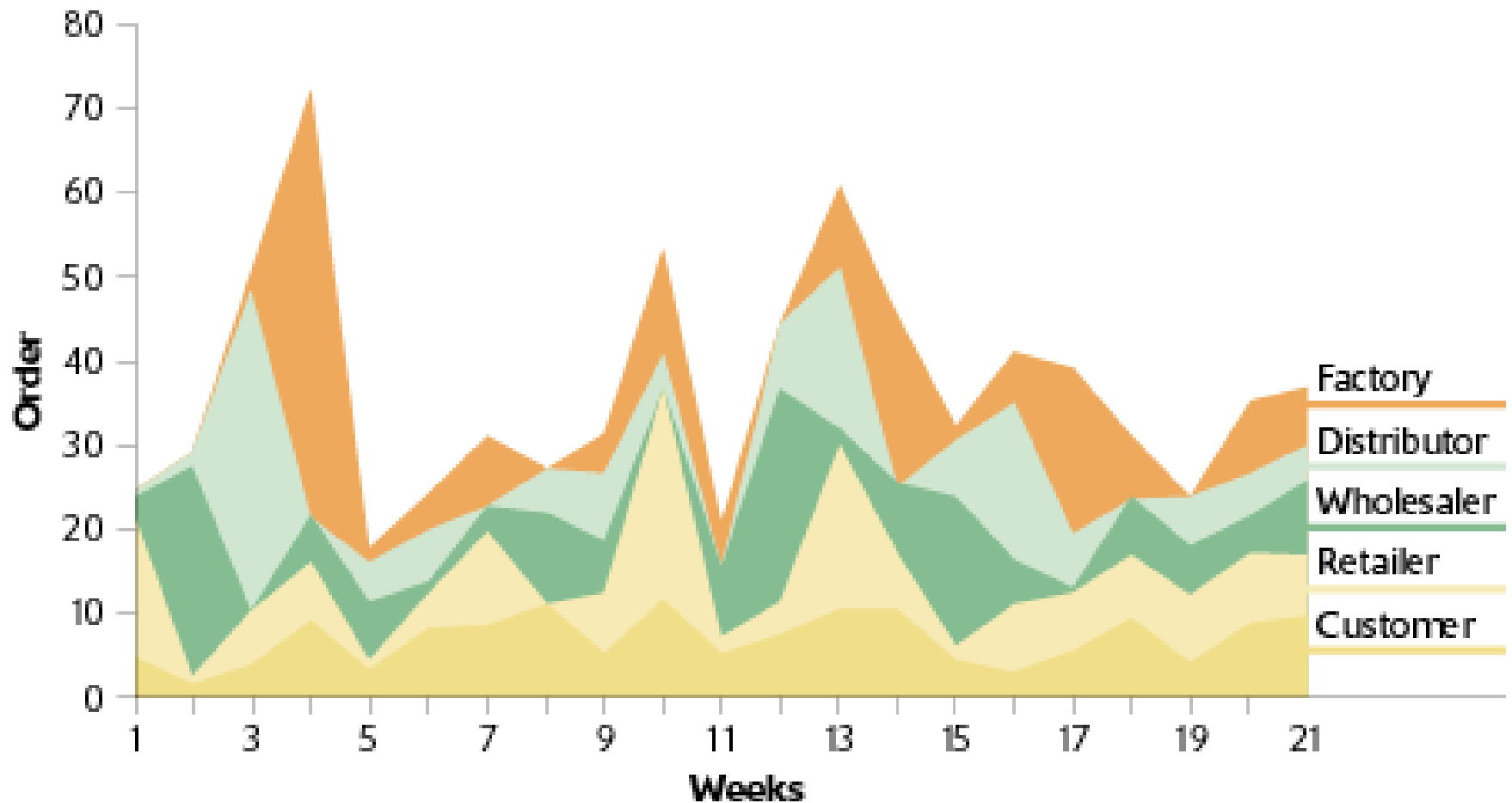
Supply chain example

- Raw material 1 week
- Production 1 week
- Distribution 1 week
- 10 cases moving to 20 cases and 10 cases in the pipe line

Increasing Variability in the Supply Chain: The Bullwhip Effect



Order Variability in the Supply Chain



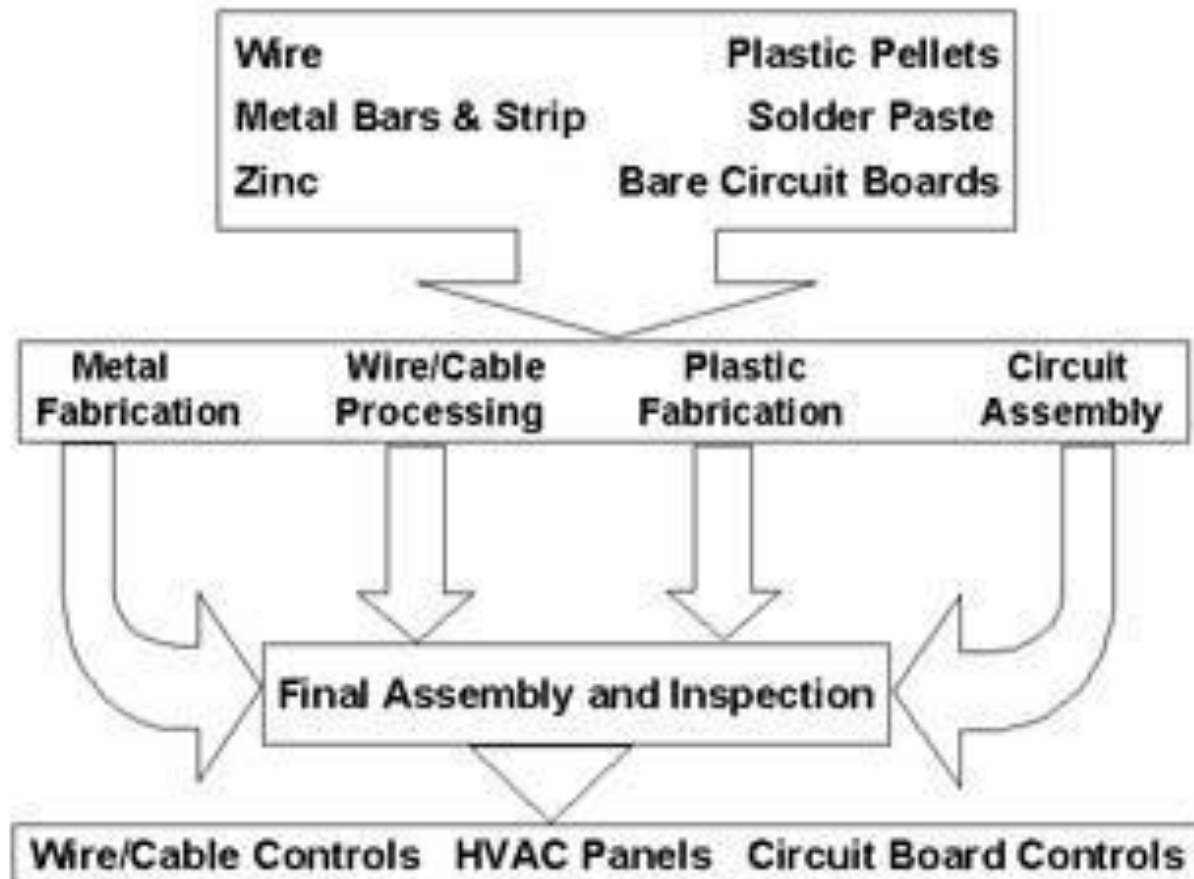
From domestic to global supply chain

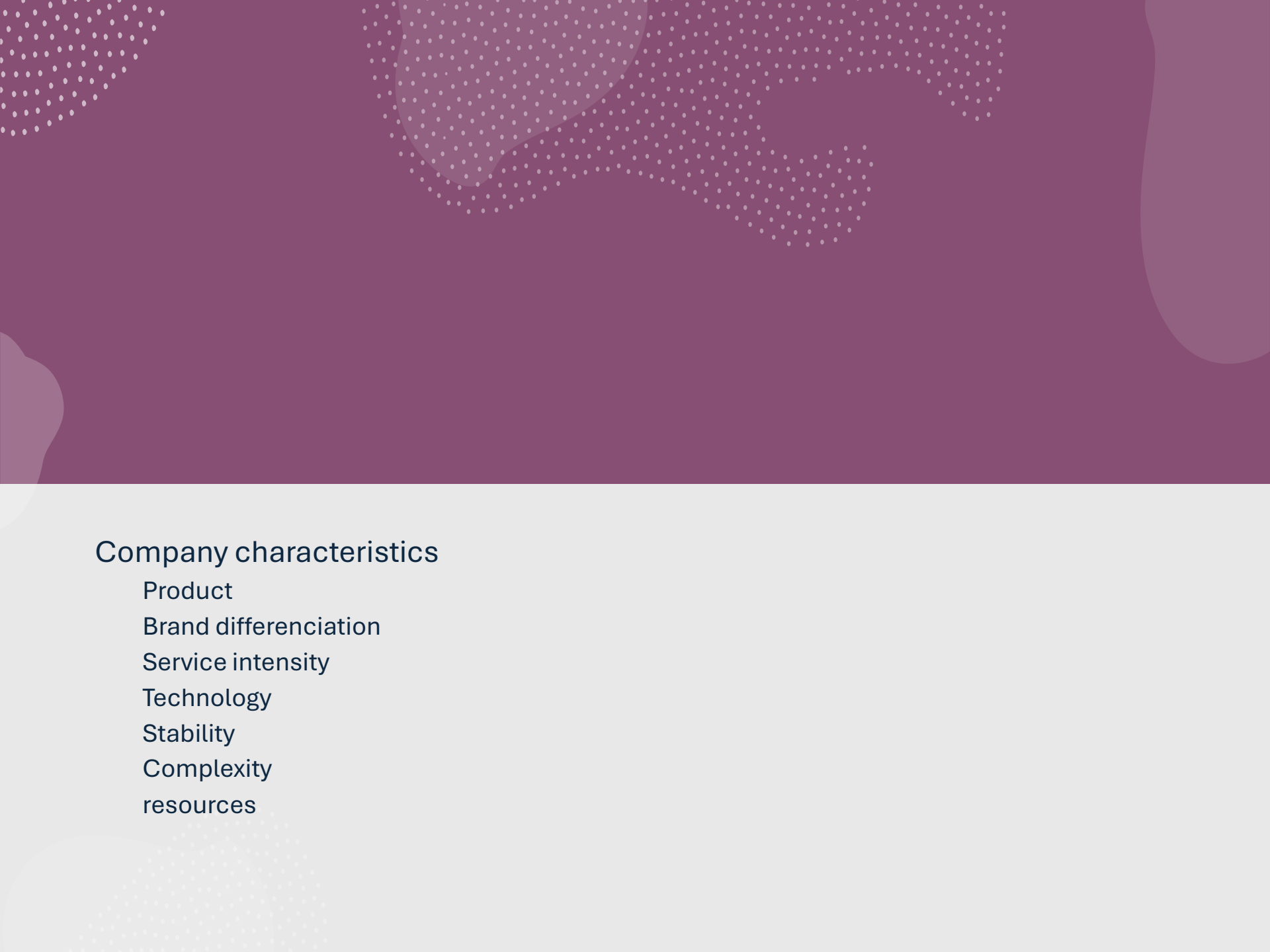
- Substantial geographic distances, long transport lead time is erratic
- Added forecasting difficulties and inaccuracies, coordinate promotion
- Exchange rates and other macro economic uncertainties
- Infrastructural inadequacies
- Lack of local process equipment and technologies, worker skills
- Inadequacies in transportation and telecommunications infrastructures
- Explosive dimensions of product varieties in global markets

3- vertical integration issues

- Country environment
 - Market
 - Labor cost & skill
 - Local managerial capacity
 - Political risk
 - Import controls
 - Cultural compatibility
 - Competitive situation
 - Fragmented distribution channels

RAW MATERIAL IN





Company characteristics

Product

Brand differentiation

Service intensity

Technology

Stability

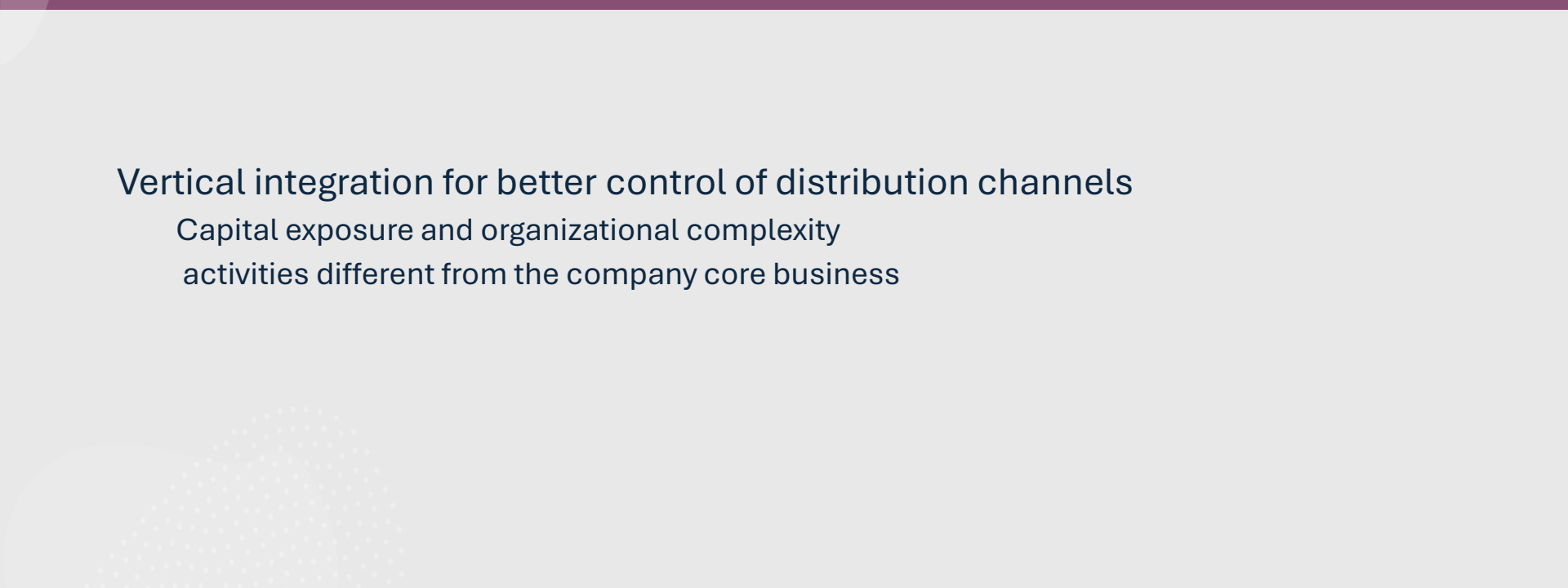
Complexity

resources



Vertical integration for better control of distribution channels

Capital exposure and organizational complexity
activities different from the company core business



Performance Indicators

Percentage invested in inventory = (Average inventory investment / Total assets) × 100

TRACKING INVENTORY INVESTMENT

- Home Depot's management wishes to track its investment in inventory as one of its performance measures. Recently, Home Depot had \$11.4 billion invested in inventory and total assets of \$44.4 billion.

Determine the investment in inventory and total assets

Percent invested in inventory = $(11.4/44.4) \times 100 = 25.7\%$

- If Home Depot can drive its investment down to 20% of assets, how much money will it free up for other uses?

Inventory as Percentage of Total Assets (with examples of exceptional performance)

Manufacturer (Toyota 5%)	15%
Wholesale (Coca-Cola 2.9%)	34%
Restaurants (McDonald's .05%)	2.9%
Retail (Home Depot 25.7%)	27%

Performance indicators

Inventory turnover = Cost of goods sold / Average inventory investment

- PepsiCo, Inc., manufacturer and distributor of drinks, Frito-Lay, and Quaker Foods, provides the following in a recent annual report (shown here in \$ billions). Determine PepsiCo's turnover.

Inventory turnover = Cost of goods sold / Average inventory investment = $14.2/1.69 = 8.4$

Net revenue		\$32.5
Cost of goods sold		\$14.2
Inventory:		
Raw material inventory	\$.74	
Work-in-process inventory	\$.11	
Finished goods inventory	<u>\$.84</u>	
Total average inventory investment		\$1.69

If Coca-Cola's cost of goods sold is \$10.8 billion and inventory investment is \$.76 billion, what is its inventory turnover?

Performance indicators

Weeks of supply = Average inventory investment / (Annual cost of goods sold / 52 weeks)

- Using the PepsiCo data, management wants to know the weeks of supply.

We know that inventory investment is \$1.69 billion and that weekly sales equal annual cost of goods sold (\$14.2 billion) divided by 52 = $\$14.2 / 52 = \0.273 billion

Weeks of supply = (Average inventory investment / Average weekly cost of goods sold) = $1.69 / 0.273 = 6.19$ weeks

- If Coca-Cola's average inventory investment is \$.76 billion and its average weekly cost of goods sold is \$.207 billion, what is the firm's weeks of supply?

Comparisons

	TYPICAL FIRMS	BENCHMARK FIRMS
Order fill rate	71%	98%
Order fulfillment lead time (days)	7	3
Cash-to-cash cycle time (days)	100	30
Inventory days of supply	50	20

Source: Institute for Industrial Engineers

Examples of Annual Inventory Turnover

FOOD, BEVERAGE, RETAIL

Anheuser Busch	15
Coca-Cola	14
Home Depot	5
McDonald's	112

MANUFACTURING

Dell Computer	90
Johnson Controls	22
Toyota (overall)	13
Nissan (assembly)	150

Measuring Supply-Chain Performance

- Assets committed to inventory

$$\text{Percentage invested in inventory} = \left(\frac{\text{Total inventory investment}}{\text{Total assets}} \right) \times 100$$

- ▶ Home Depot had \$11.4b inventory, total assets of \$44.4b

$$\text{Percentage invested in inventory} = \left(\frac{11.4}{44.4} \right) \times 100 = 25.7\%$$

Distribution Management



The outbound flow of products

Rapid response
Product choice
Service



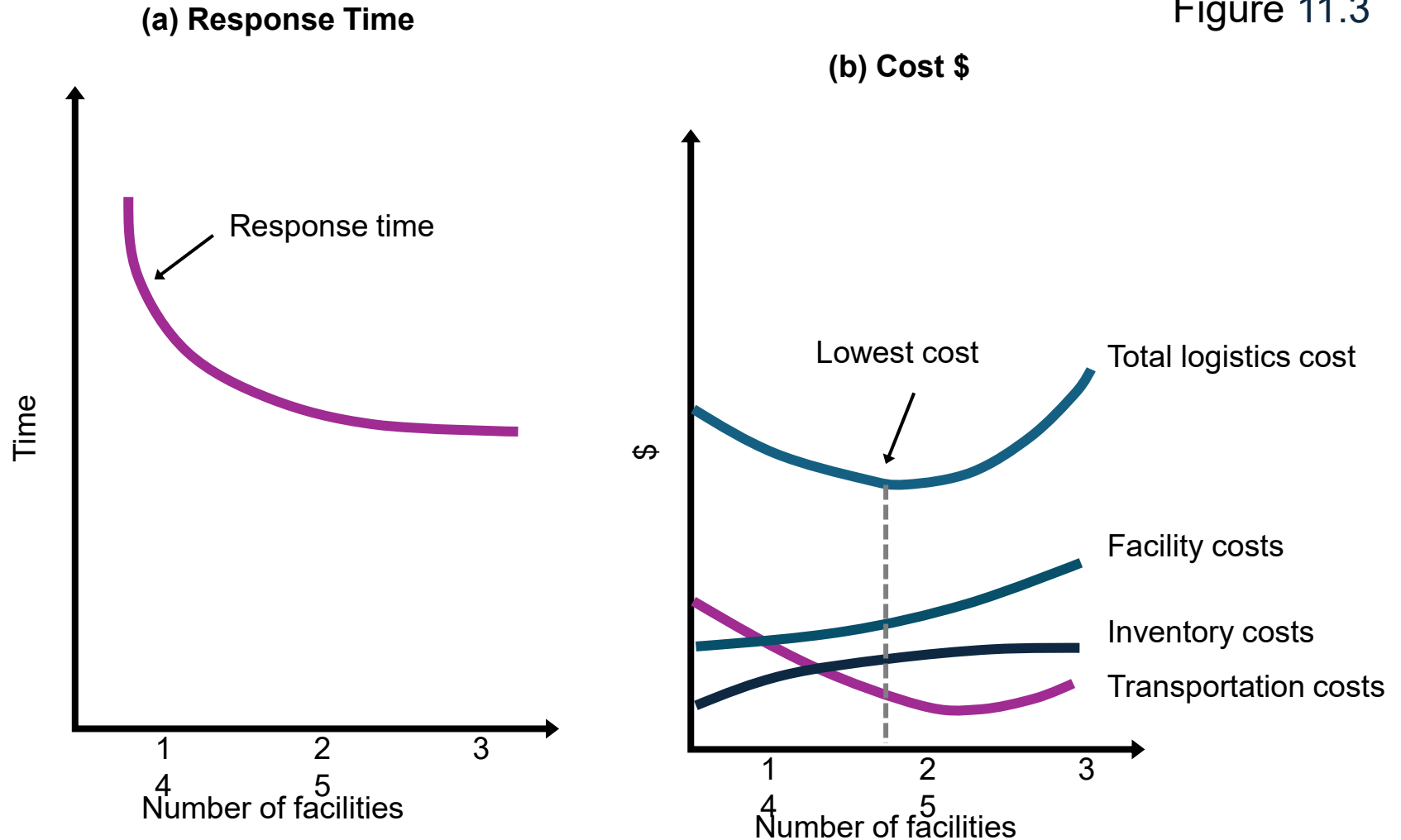
Increasing the number of facilities generally improves response time and customer satisfaction



Total costs are important

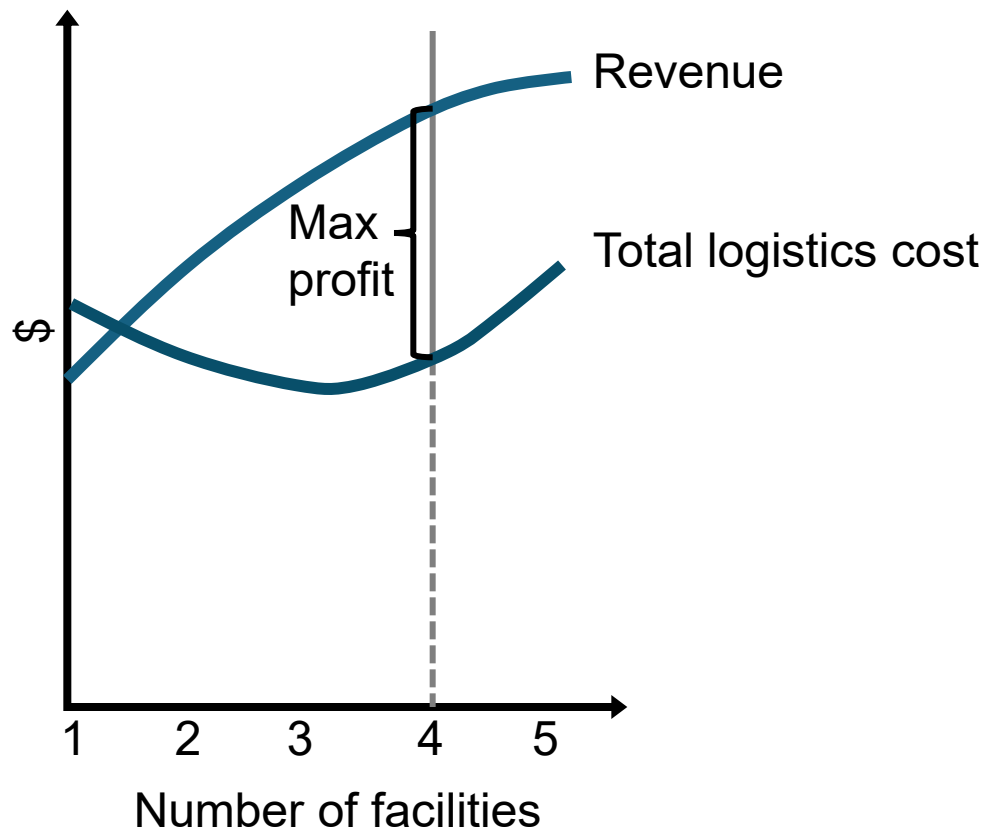
Distribution Management

Figure 11.3



Distribution Management

(c) Cost, Revenue, and Profit



Establishing Sustainability in Supply Chains



Return or reverse logistics

Sending returned products back up the supply chain for resale, repair, reuse, remanufacture, recycling, or disposal



Closed-loop supply chain

Proactive design of a supply chain that tries to optimize all forward and reverse flows

Prepares for returns prior to product introduction

Establishing Sustainability in Supply Chains

ISSUE	FORWARD LOGISTICS	REVERSE LOGISTICS
Forecasting	Relatively straightforward	More uncertain
Product quality	Uniform	Not uniform
Product packaging	Uniform	Often damaged
Pricing	Relatively uniform	Dependent on many factors
Speed	Often very important	Often not a priority
Distribution costs	Easily visible	Less directly visible
Inventory management	Consistent	Not consistent

Part II – International distribution



Available
networks

Wholesaling in
foreign markets

Service

Retailing in foreign
markets

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graph TD; A[Retailing services] --> B[Marketing through foreign distribution channels];
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Retailing services

Carrying inventory

Product display

Distribution trends in world markets

- Four major distribution trends
- Internationalization of retailing
- Direct marketing
- Discounting

Marketing through foreign distribution channels

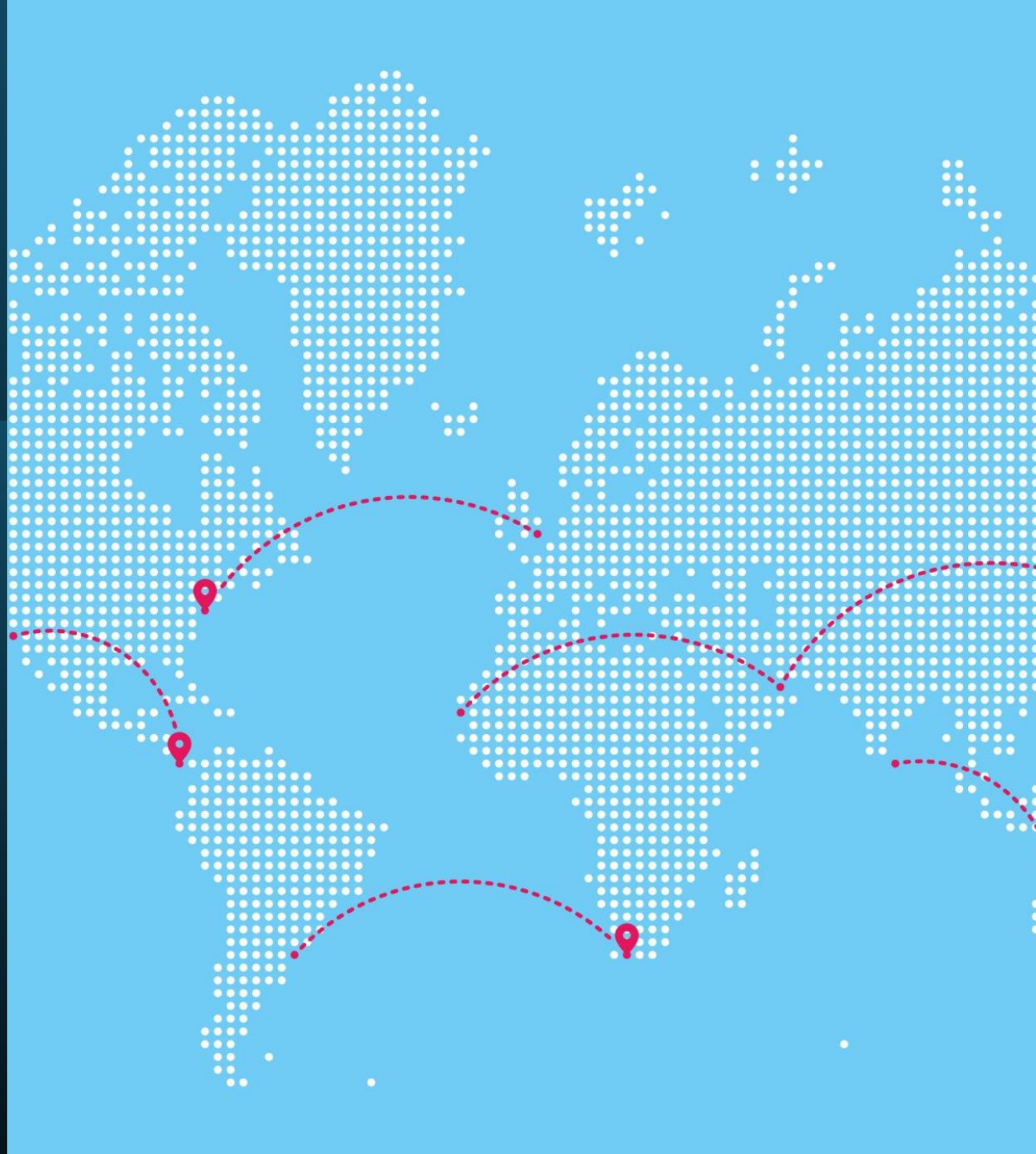
International or national patterns

- Direct versus indirect channels
- Selective versus intensive distribution
- Working with the channel
- Keeping channels up-to-date
 - Growth of a firm in a market
 - Large-scale retailing
 - Other changes



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INTERNATIONAL DISTRIBUTION



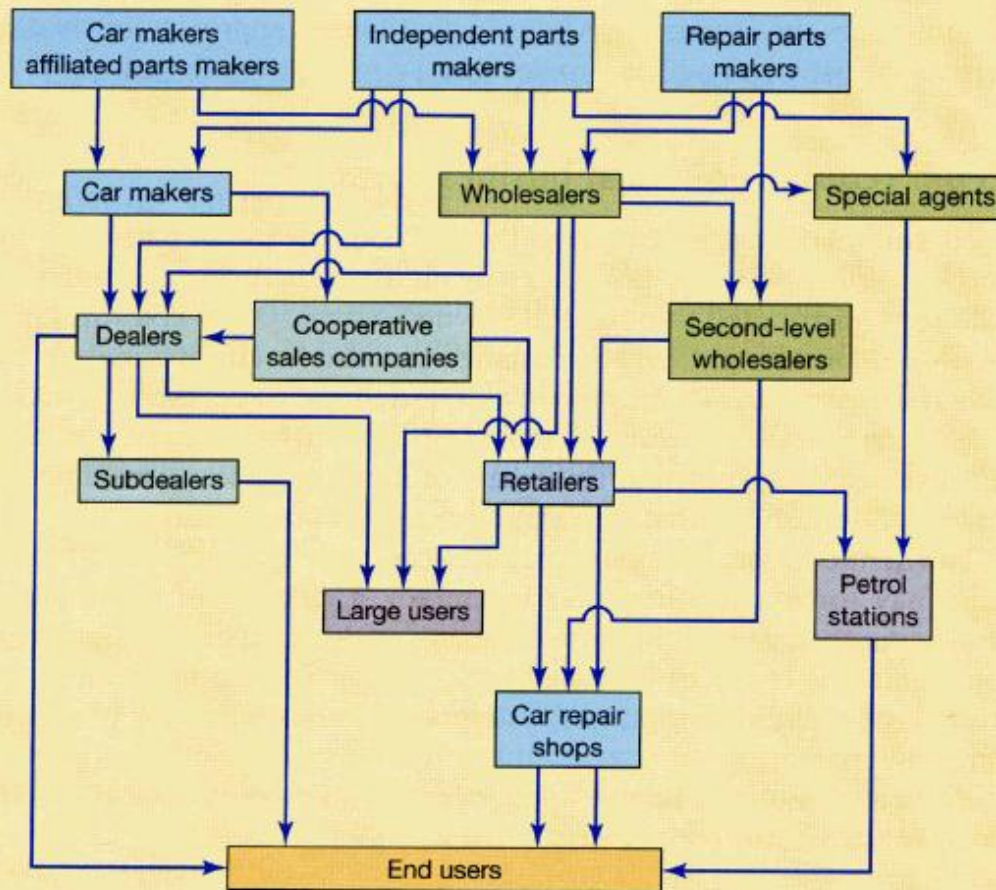
Structure of international distribution networks

Table 17.1 Value added in the vertical chain (% of retail price, estimated)

Actor in the vertical chain	Cars	Software	Petrol	Laser printers	Packaged goods
Supplier of raw materials/components	45	10	53	40	26
Manufacturer of finished goods	40	65	19	30	33
Distribution channel	15	25	28	30	41
Total	100	100	100	100	100

Source: Bucklin *et al.*, 1996, p. 106. The figures in the table are based on research conducted by, among others, the Economist Intelligence Unity and McKinsey.

(a) Japan



(b) USA

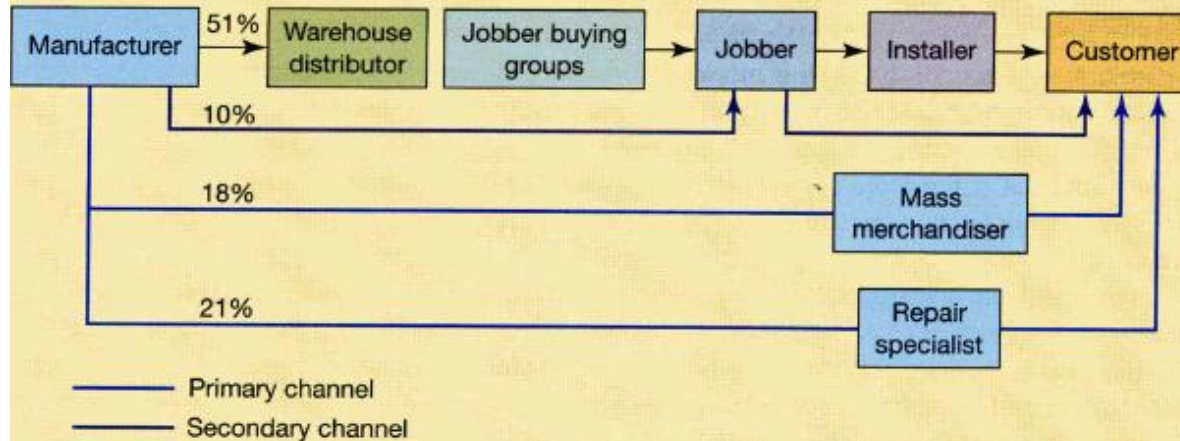
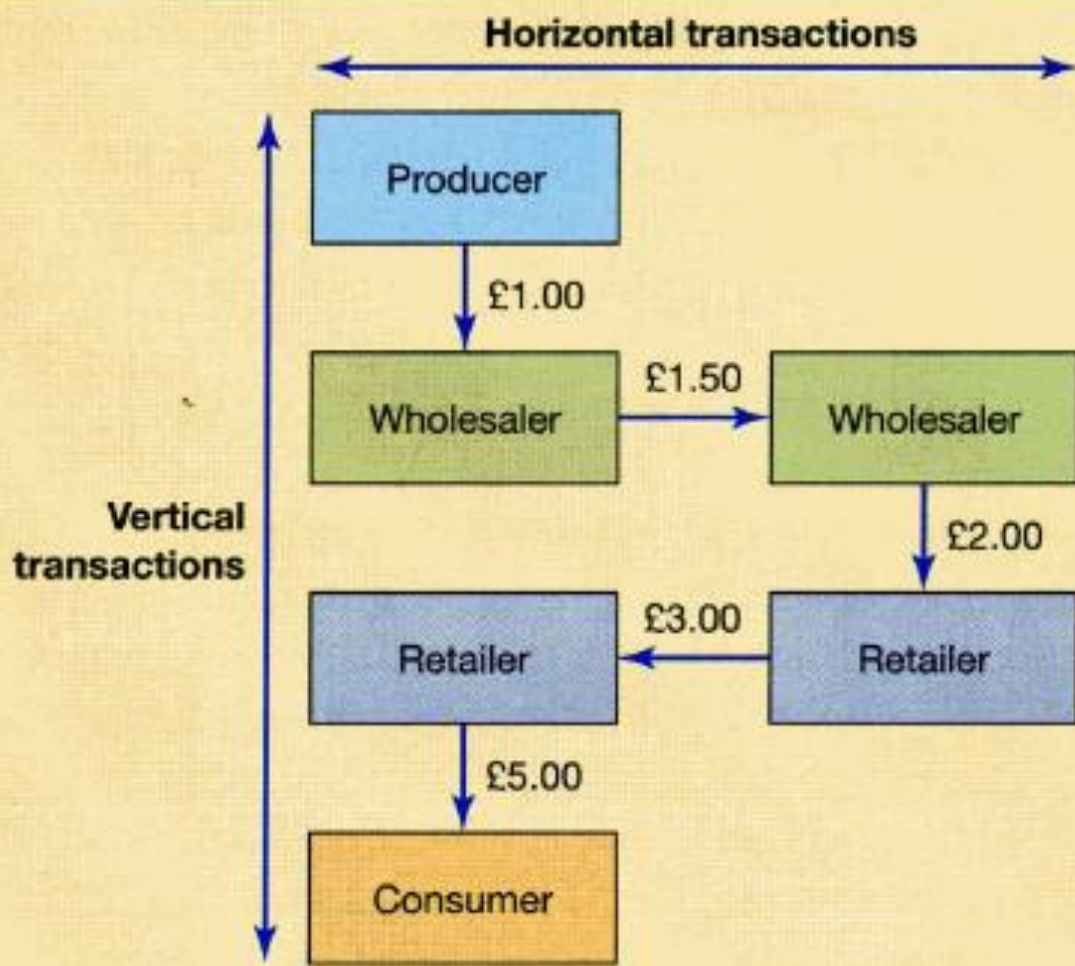


Figure 17.3 A hypothetical channel sequence in the Japanese consumer market



The structure of the channel

- Market coverage

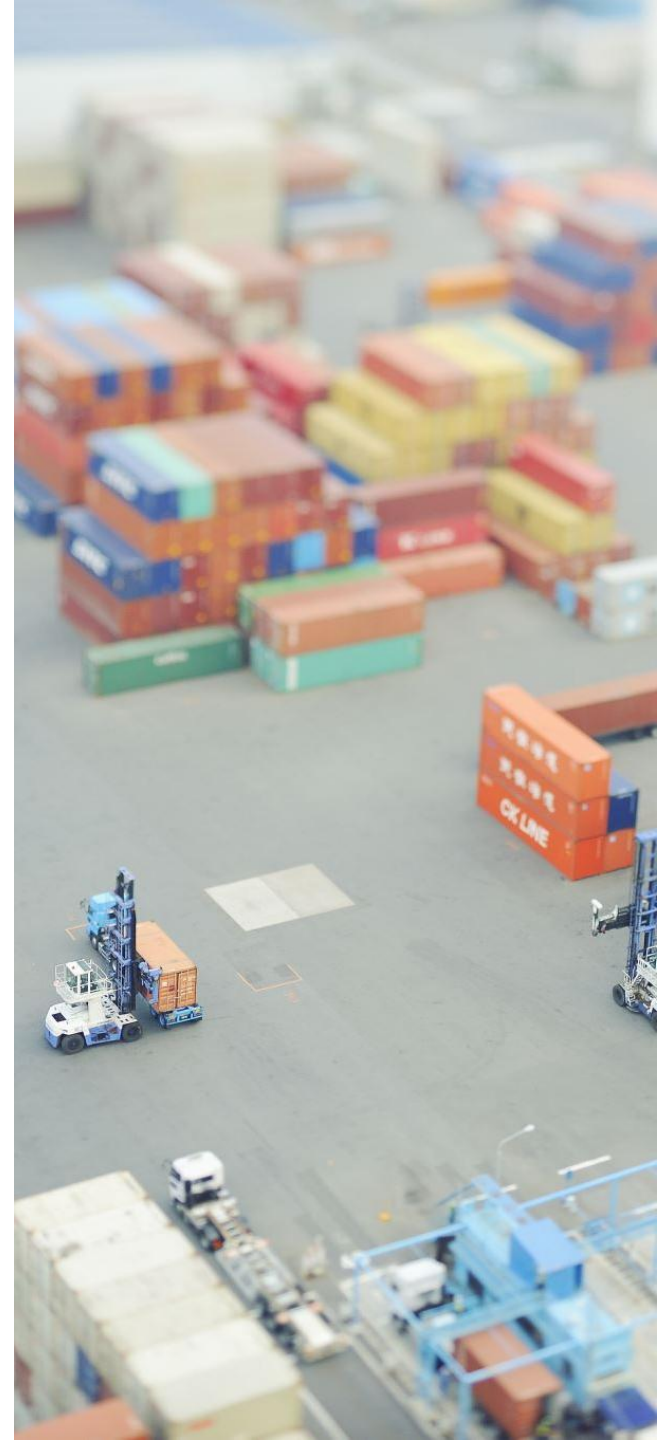


Figure 17.4 Three strategies for market coverage

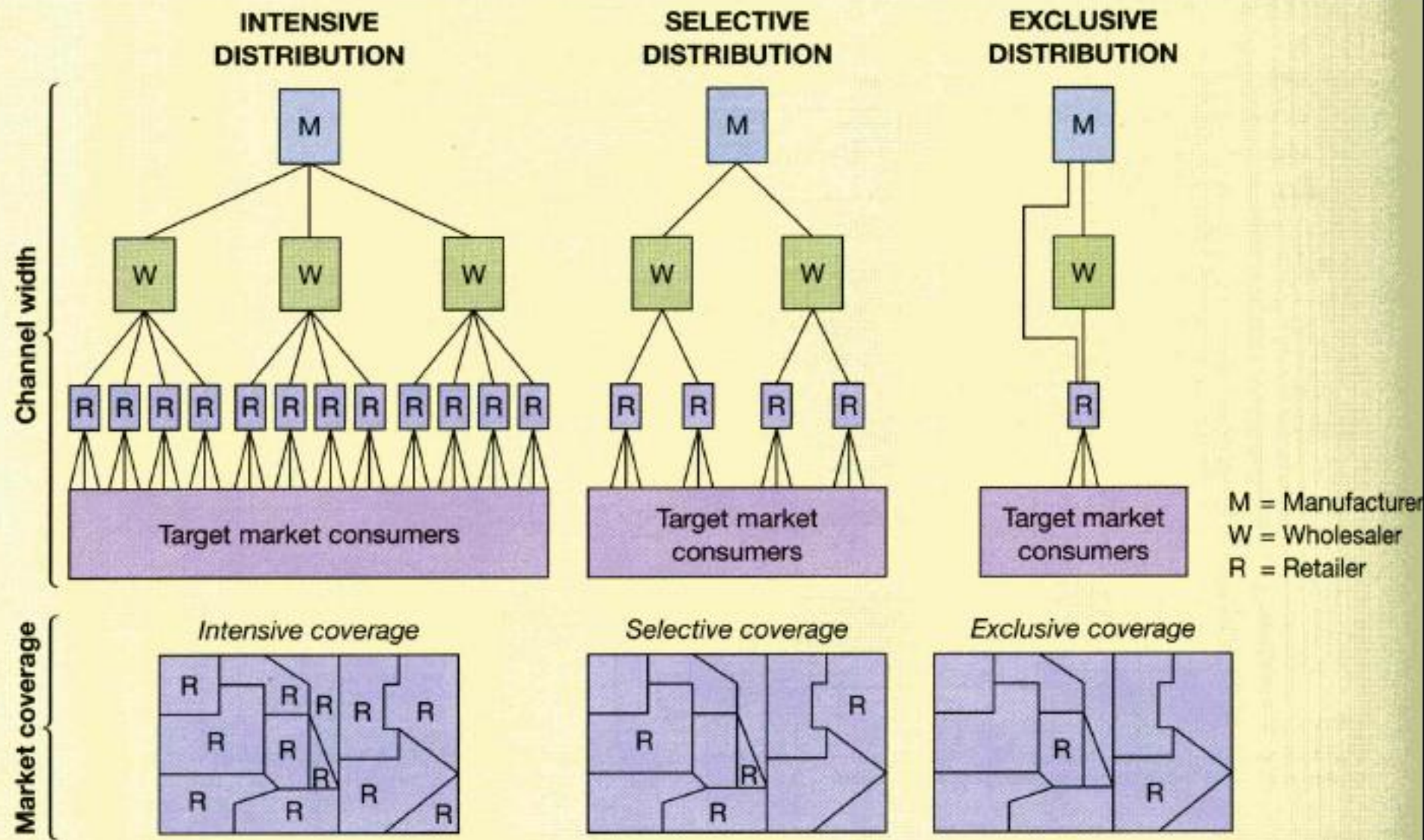
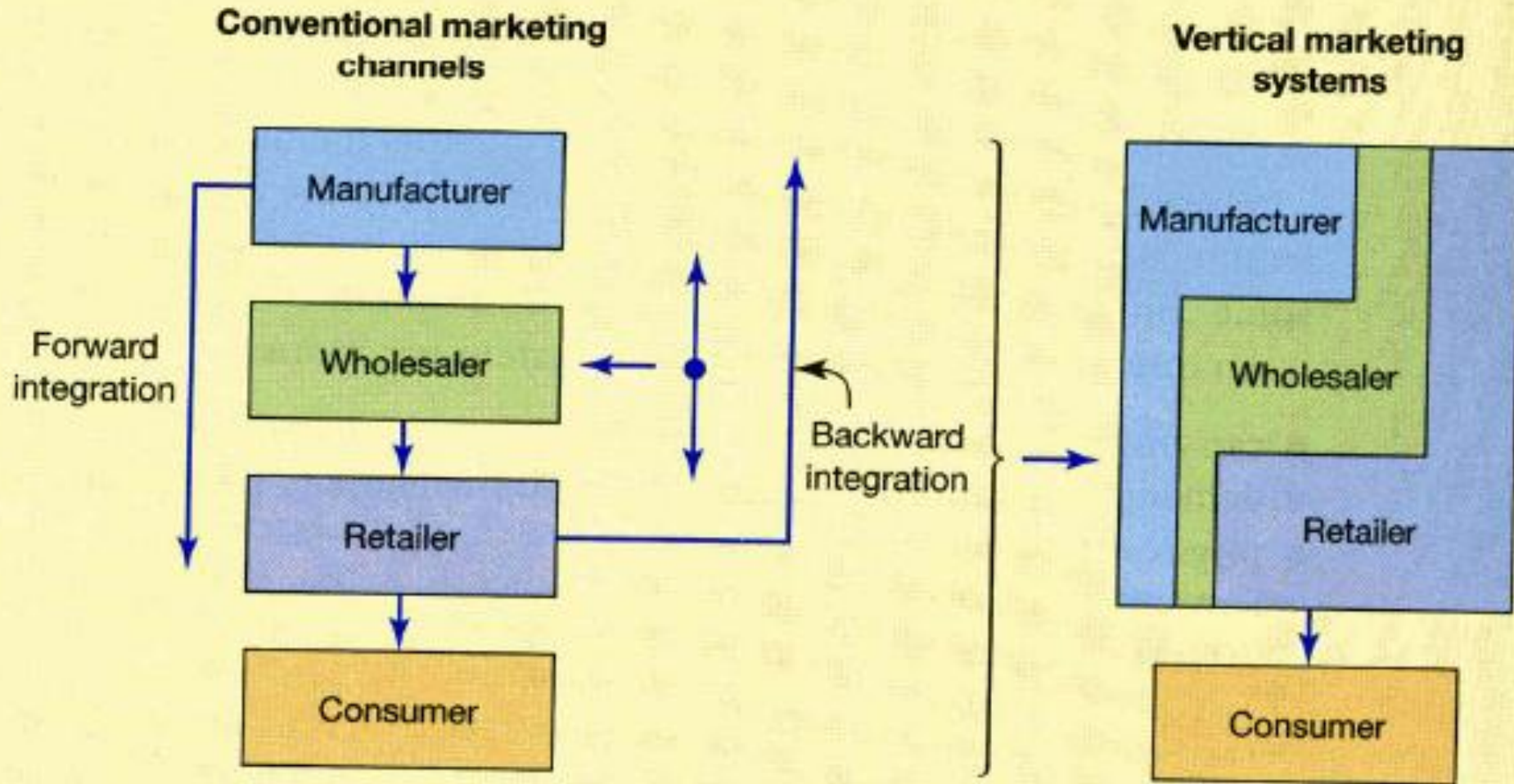


Figure 17.5 Factors influencing channel width

		Channel width		
		<i>Intensive distribution</i>	<i>Selective distribution</i>	<i>Exclusive distribution</i>
Factor	<i>Product type</i>	Convenience products	↔	Speciality products
	<i>Product life cycle stage</i>	Mature products	↔	New products
	<i>Product price</i>	Low-price products	↔	High-price products
	<i>Brand loyalty</i>	Brand-preferred products	↔	Brand-insisted products
	<i>Purchase frequency</i>	Frequently purchased products	↔	Infrequently purchased products
	<i>Product uniqueness</i>	Common products	↔	Distinctive products
	<i>Selling requirement</i>	Self-service products	↔	Personal-selling products
	<i>Technical complexity</i>	Non-technical products	↔	Technical products
	<i>Service requirements</i>	Limited-service products	↔	Extensive-service products

Degree of integration

Figure 17.6 Vertical integration



Criteria (no ranking implied)	Weight	Distributor 1		Distributor 2		Distributor 3	
		Rating	Score	Rating	Score	Rating	Score
Financial soundness and depth of channel member	4	5	20	4	16	3	12
Marketing management expertise and sophistication	5	4	20	3	15	2	10
Satisfactory trade, customer relations and contacts	3	4	12	3	9	3	9
Capability to provide adequate sales coverage	4	3	12	3	12	3	12
Overall positive reputation and image as a company	3	5	15	4	12	4	12
Product compatibility (synergy or conflict?)	3	3	9	4	12	4	12
Pertinent technical know-how at staff level	—	—	—	—	—	—	—
Adequate technical facilities and service support	—	—	—	—	—	—	—
Adequate infrastructure in staff and facilities	1	5	5	3	3	3	3
Proven performance record with client companies	2	4	8	3	6	3	6
Positive attitude towards the company's products	1	3	3	3	3	3	3
Mature outlook regarding the company's inevitable progression in market management	1	3	3	3	3	3	3
Excellent government relations	1	4	4	3	3	3	3
Score			111		94		85

Scales:

Rating

5 Outstanding

4 Above average

3 Average

Weighting

5 Critical success factor

4 Prerequisite success factor

3 Important success factor

Rating

2 Below average

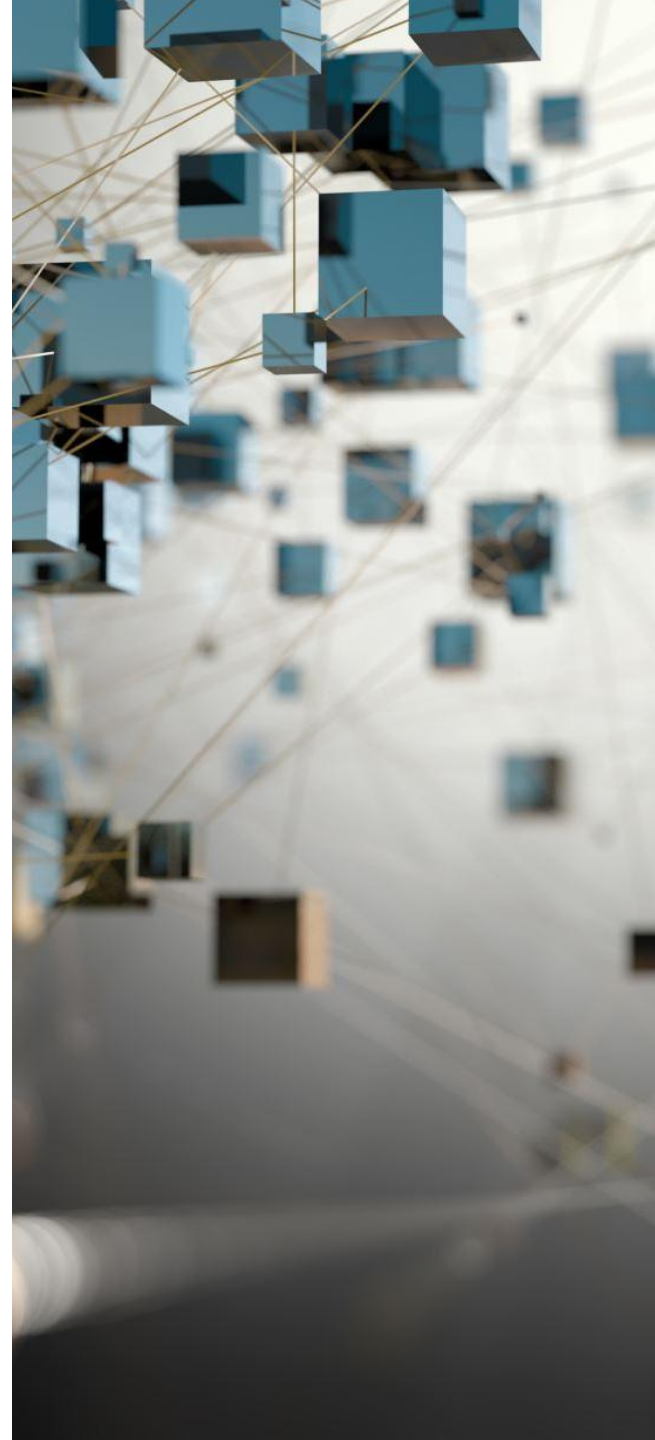
1 Unsatisfactory

Weighting

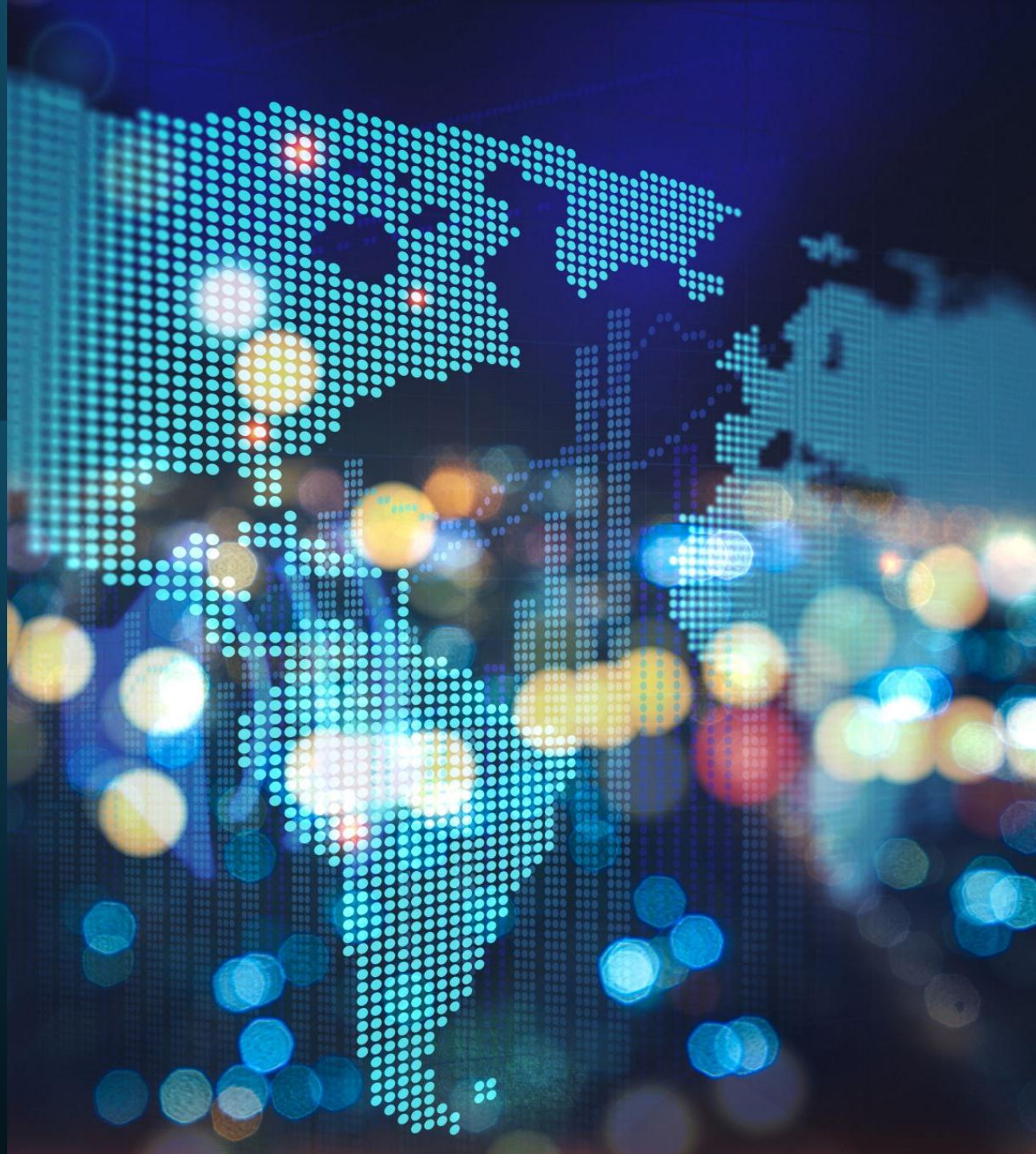
2 Of some importance

1 Standard

- Grey markets and unofficial distribution channels
 - internet



EVALUATION OF GLOBAL RETAILING WORLDWIDE



Evaluating retail globalization

What are the keys
to success in
retail
globalization ?

Main trends

2025 RETAIL WORLD

Rank Retailer		Home Country	Revenue (\$B)	Stores Points	
1	Walmart	USA	\$692	10,816	509
2	Amazon.com	USA	\$422	620	397
3	Schwarz Group	Germany	\$189	14,667	294
4	Aldi	Germany	\$166	14,215	271
5	Costco	USA	\$266	915	233
6	Ahold Delhaize	Netherlands	\$103	9,937	171
7	Carrefour	France	\$93	13,318	132
8	IKEA	Netherlands	\$49	486	95
9	Home Depot	USA	\$162	2,362	94
10	Walgreens Boots Alliance	USA	\$127	11,605	85

11	Seven & I	Japan	\$66	38,491	77
12	Rewe	Germany	\$73	12,451	69
13	Jeronimo Martins	Portugal	\$40	7,075	68
14	AS Watson	Hong Kong	\$38	15,569	66
15	Apple	USA	\$85	531	60
16	Inditex	Spain	\$42	5,336	59
17	Metro AG	Germany	\$31	7,239	54
18	Tesco	UK	\$73	4,906	50
19	TJX	USA	\$59	5,240	49
20	Alibaba	China	\$76	457	46
21	Aeon	Japan	\$70	11,042	41
22	H&M	Sweden	\$20	3,867	38
23	Auchan	France	\$32	2,283	37
24	Intermarche	France	\$49	4,088	36
25	Coop Schweiz	Switzerland	\$35	3,166	35
26	Aspiag	Switzerland	\$17	2,456	35
27	Fast Retailing	Japan	\$24	3,544	33
28	Sephora (LVMH)	France	\$18	2,172	33
29	Couche-Tard	Canada	\$18	13,291	32

30	Leclerc	France	\$51	2,006	30
31	Ceconomy	Germany	\$23	975	29
32	Adeo Group	France	\$23	1,032	29
33	Decathlon	France	\$17	1,853	27
34	Action	Netherlands	\$17	3,336	27
35	Euronics International	Netherlands	\$13	4,110	26
36	Best Buy	USA	\$42	1,103	26
37	JD Sports	UK	\$14	6,004	23
38	Cencosud	Chile	\$17	1,264	22
39	CP All	Thailand	\$31	18,589	21
40	Kingfisher	UK	\$16	1,686	20
41	FamilyMart	Japan	\$26	24,955	20
42	lululemon	Canada	\$10	765	20
43	dm drogerie markt	Germany	\$20	4,189	19
44	Primark	UK	\$13	463	18
45	Phoenix	Germany	\$9	4,336	18
46	Expert	Switzerland	\$9	1,816	17
47	Reliance	India	\$33	4,682	17
48	Migros	Switzerland	\$28	2,580	16



Current changes

TOOLS AND DECISIONS

Leverages to reduce GHG



Building where we store



Use materials that emit less than concrete (during production and recycling), such as raw earth



Favoring recycled materials



Focus on high-quality, long-lasting buildings and constructions (paintwork, cladding, etc.) (and amortize emissions over their actual lifespan)



New-build: HQE construction



Improve insulation and use materials with thermal inertia (limit air conditioning)



Building selection based on CO₂ emissions and energy consumption criteria



Greening of space (CO₂ capture)

Energy and store



Lighting: choice of equipment and regulation (relamping), presence detectors, use of daylight



Automatic door opening and closing



Solar panels



Revegetation
(climate reduction)



White-painted
(air-conditioning
reduction)



Adapt temperature to actual needs



Recycle waste heat (emitted
thermal energy)



Segment and isolate hot and cold zones to
heat/cool only the necessary volumes.



Select refrigerants with the lowest GWP
(Global Warming Potential)

Equipment and operations

----- Equipment



Lowest-emission forklift (full life cycle)



Add sensors to measure machine consumption

----- Operations



Optimizing the use of space and picking routes



Reduce warehouse emptiness (over time)



Optimizing packaging



Selection of logistician according to optimized transport scheme / production site and/or customer delivery points



Optimize inventory: see PlanWaste



Waste: see Return

Transport levers



Packaging optimization



Optimized filling (and therefore load rates)



Selection of road hauliers with the Objectif CO₂ charter or label



Reducing empty returns (e.g. by schedule product or media returns)



Transport pooling (between several sites or several shippers)



Route optimization (own fleet)



Choice of tires (own fleet)



Lease vehicles instead of buying them and extend the contract period (vehicle maintenance) (clean fleet)

Return & Recycling levers

-- Equipment



Measuring the rate and causes of returns



Analyze the types and causes of returns to reduce them



Analyze the benefits (economic and CO₂) of returning a product (vs. destroying it)

-- Back to handling supports



Packaging design



Use recycled plastic containers



Use collapsible or nestable pallets: optimize returns



Avoid the physical return of pallets: use pallet movement optimization and compensation platforms



Use stackable and collapsible containers made of recycled plastic



Repaired and refurbished wooden pallets

-- Product recycling/destruction



Decision on storage vs. incineration: incineration emits 3x more than storage for re-use (in a recycling chain)



Emissions avoided by recycling are not deducted



Circular supply chain

Levers in Supply Chain

..... Supply Chain Plan



Network design:
optimizing the
positioning and size
of platforms and the
transport network



Delayed
differentiation



..... Plan Source



Choice of sourcing zones



Packaging a

..... Plan Return



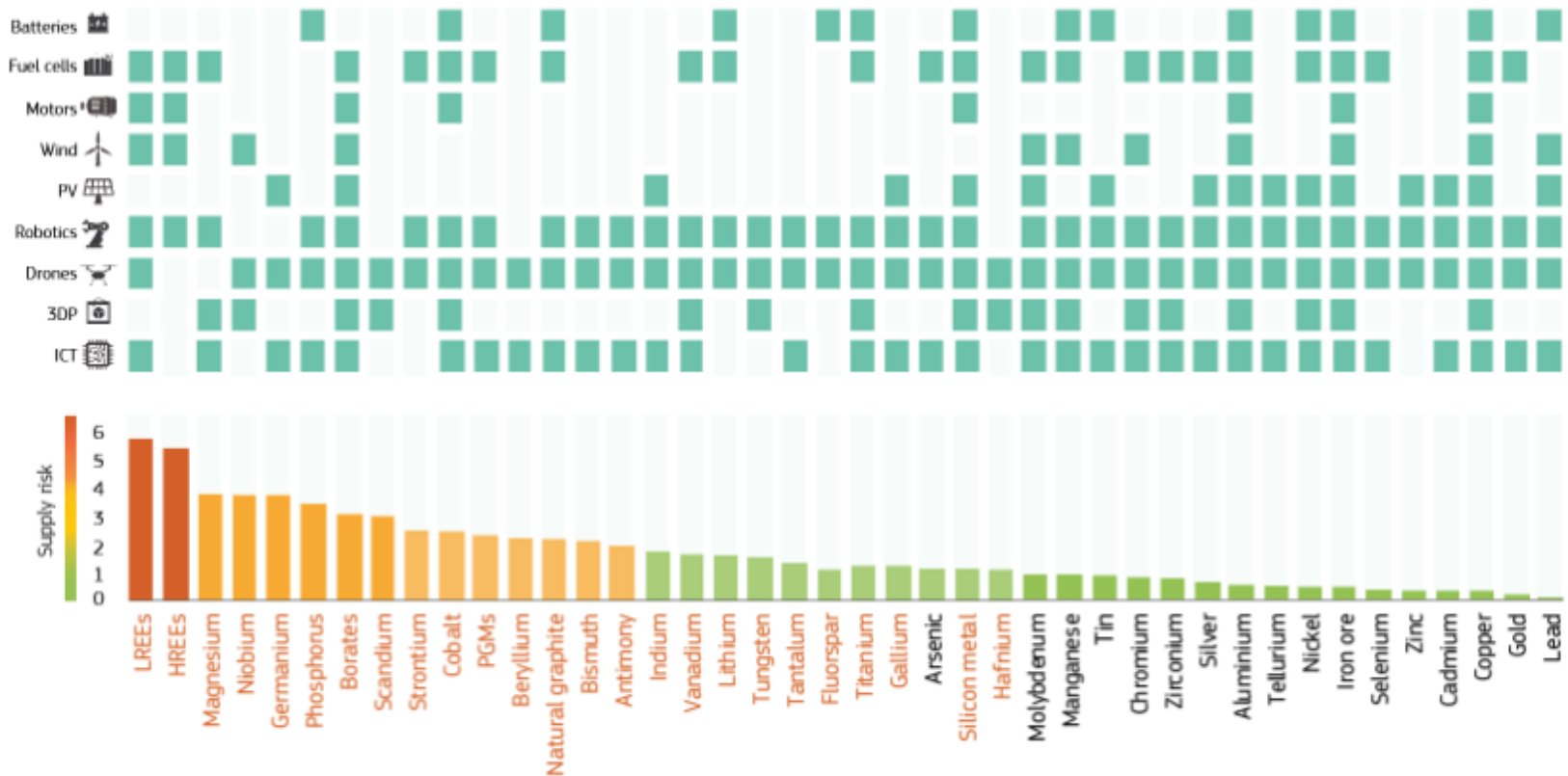
Developing circularity: optimizing
sorting connections



Optimize the
to customers

Circular Economy for sustainable development ?

SUPPLY RISK OF RAW MATERIALS FOR KEY TECHNOLOGIES



Circular economy Light Rare Earth Elements (LREE)

Element	Symbol	Atomic Number	Common Uses
Lanthanum	La	57	Camera lenses, batteries, catalysts
Cerium	Ce	58	Glass polishing, catalytic converters
Praseodymium	Pr	59	Magnets, aircraft engines, glass coloring
Neodymium	Nd	60	High-strength magnets, headphones, wind turbines
Promethium	Pm	61	Nuclear batteries, luminous paint (rare and radioactive)
Samarium	Sm	62	Magnets, neutron capture in nuclear reactors
Europium	Eu	63	Red and blue phosphors in screens, anti-counterfeiting
Gadolinium	Gd	64	MRI contrast agents, neutron shielding

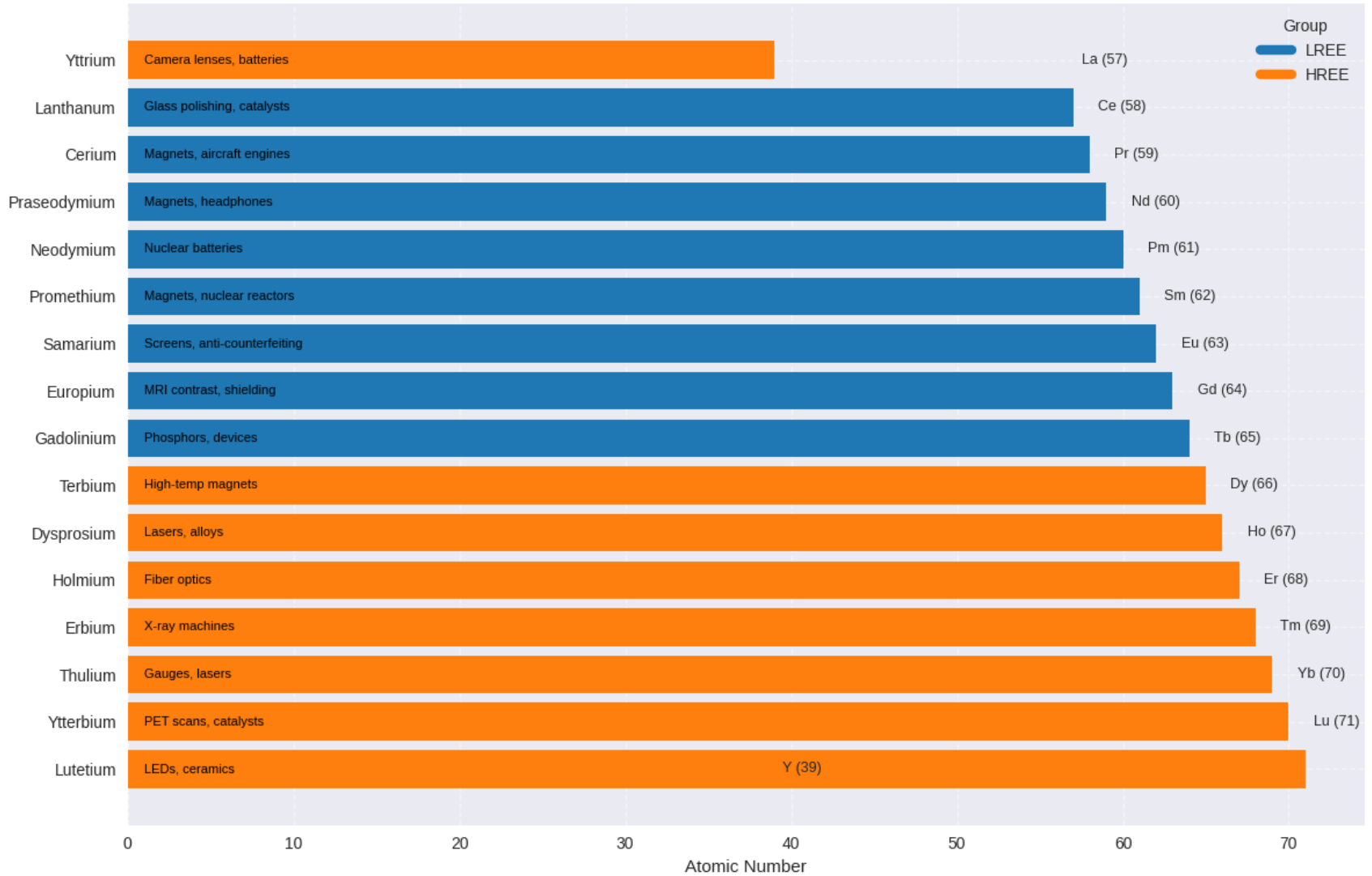
Circular economy

Heavy Rare Earth Elements (HREE)

Element	Symbol	Atomic Number	Common Uses
Terbium	Tb	65	Green phosphors, solid-state devices
Dysprosium	Dy	66	High-temperature magnets, nuclear reactors
Holmium	Ho	67	Lasers, magnetic alloys
Erbium	Er	68	Fiber optics, lasers
Thulium	Tm	69	Portable X-ray machines, lasers
Ytterbium	Yb	70	Stress gauges, infrared lasers
Lutetium	Lu	71	PET scan detectors, catalysts
Yttrium	Y	39	LEDs, superconductors, ceramics

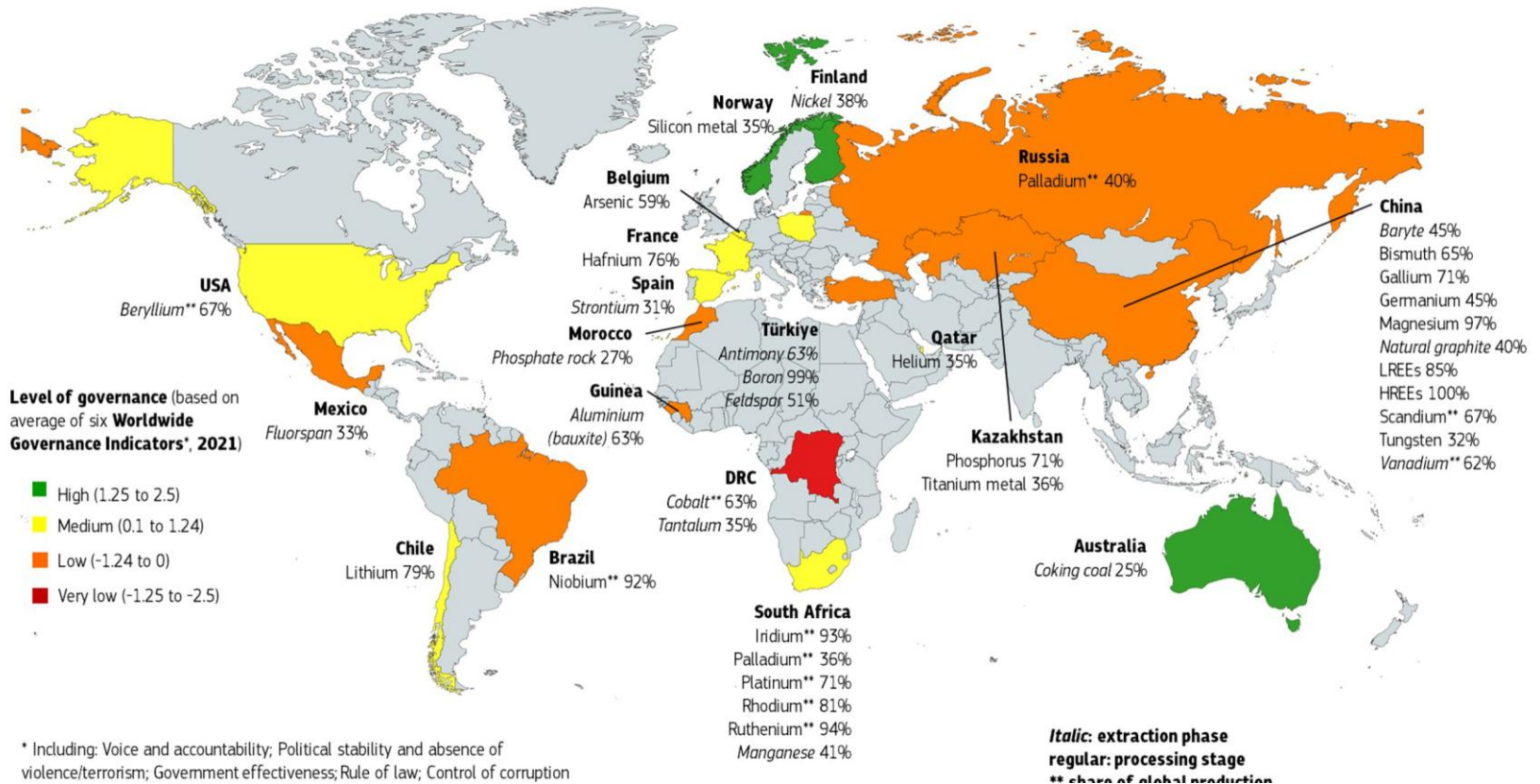
Rare – more complex to extract

Comparative Chart of Light and Heavy Rare Earth Elements



Resources

Countries accounting for largest share of EU supply of CRMs



* Including: Voice and accountability; Political stability and absence of violence/terrorism; Government effectiveness; Rule of law; Control of corruption

Design and production stage

R-Strategy

R0 – Refuse / Reduce

Avoid using materials, avoid buying, eliminate unnecessary components

R1 – Rethink (*sometimes merged with R0*)

Design multifunctional or more efficient products

R2 – Reduce / Reuse / Resell

Use less material; design for reuse; enable second-hand markets

Lifecycle Stage

Design (concept phase)

Design

Design → Production → Use

Maintenance and life extension

R-Strategy

R3 – Repair

Fixing defects to extend product life

R4 – Refurbish

Bringing product back to good working condition

R5 – Remanufacture / Repurpose

Rebuilding product to like-new condition; repurposing components

Lifecycle Stage

Use

Use → Post-use

Use → Post-use

R-Strategy

R6 – Recycle (materials)

R7 – Recover (energy)

R8 – Re-mine

Reprocessing materials into new raw materials

Incineration with energy recovery

Extracting materials from landfills or waste streams

Lifecycle Stage

End-of-life

End-of-life

End-of-life / Post-waste

Lifecycle Stage

Design & Concept

Production

Use / Maintenance

End-of-Life

R-Strategies

R0, R1, R2

R2

R3, R4, R5

R6, R7, R8, R9

Value Retention Level

Highest

Medium

Medium

Lowest

The 100 most sustainable companies of 2025

World's Most Sustainable Companies of 2025 | TIME

Forbes 2025 Net Zero Leaders List of Top Eco-Friendly Companies

Example	Country
Schneider Electric	France
Siemens AG	Germany
GE Vernova (electrification and décarbonation)	United States
Novartis (énergie renouvelable)	Switzerland
Sanofi	France