# Solutions for Supply Chain Management A Learning Perspective 3rd Edition by Kim

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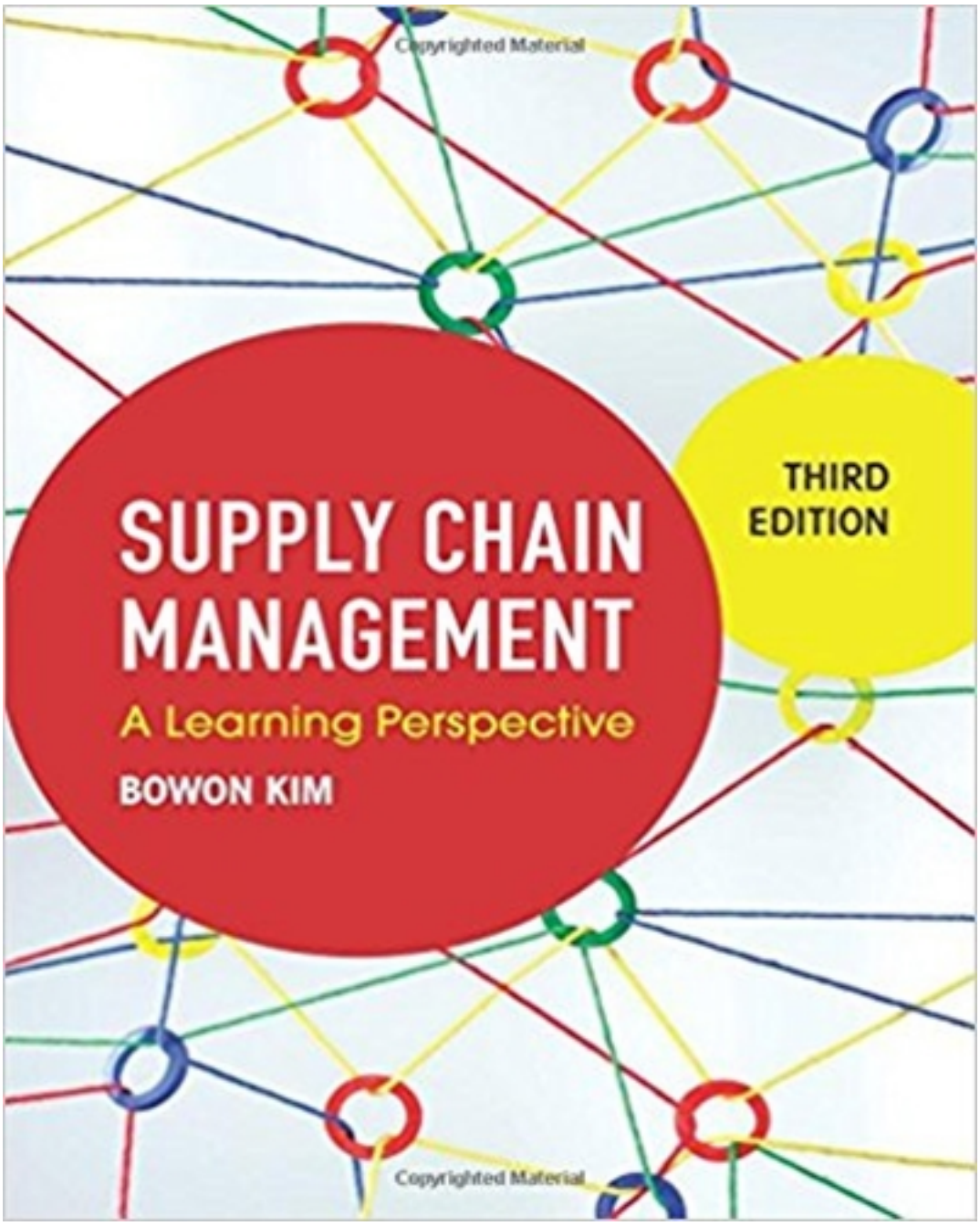


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# Supply Chain Management: A Learning Perspective

Bowon Kim

## Instructor's Manual

**Chapter 2** Learning and Learning Perspective

### 1. Chapter synopsis

In this chapter, we discuss what the learning and learning perspective are, and why it is important to approach operations and supply chain management issues from a learning perspective. We also discuss two perspectives (i.e., horizontal and vertical perspectives) to understand essential characteristics of operations capability.

### 2. Learning goals

The students will learn:

- how to define learning and learning capability and how they relate to SCM,
- what are single-loop, double-loop learning and learning propensity model,
- what are the three representative operations capabilities and how the firm can overcome the trade-off relationship using integrating capability,
- what is the chain of capability.

### 3. Chapter summary

Learning is quintessential for managing a supply chain effectively. Learning in operations is a process through which a company identifies, analyzes, and internalizes complex cause-and-effect relationships for operations problems. Learning capability is the ability to enhance its performance through applying its learning to solving real-world managerial problems.

There are two different types of learning processes, i.e., single-loop and double-loop learning. Single-loop learning is short-term oriented, fixing the symptoms. Double-loop learning is long-term oriented, tackling root causes underlying problem symptoms. A capable organization should integrate the two types of learning in a balanced way. Learning propensity model suggests how an organization develops a learning propensity for either on-shop or off-shop learning over time.

There are horizontal and vertical perspectives to understand characteristics of operations capability. In the horizontal perspective, operations capabilities consist of controllability,

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flexibility, and integrating capability. Although there is a trade-off relationship between efficiency and flexibility in a short-term, a firm can mitigate the trade-off by improving integrating capability (learning). In the vertical perspective, a chain of capability suggests a hierarchical perspective for capabilities, i.e., basic - control (process) - system capability.

4. Answers to the discussion questions

1) Can you define a learning organization?

A learning organization is an organization that solves managerial problems and enhances its performance by applying its understanding of cause-and-effect relationships on the problems.

2) Why is it important to take a learning perspective in studying supply chain management?

Coordination between strategic supply chain partners is the key to successful implementation of effective SCM. But such coordination cannot be forged without mutual learning between partners. Building a relationship that facilitates the coordination between strategic partners is the process of learning, learning from each other as well as learning how to solve supply chain problems together more effectively.

3) Explain and compare single-loop and double-loop learning.

In a single-loop learning, an organization tries to fix the symptoms without tackling more fundamental causes. Thus, the single-loop learning is short-term oriented, focusing on mitigating temporary irregularity. However, in the double-loop learning, an organization directly identifies and rectifies the root causes underlying problem symptoms. Therefore, the double-loop learning is more long-term oriented. An organization should integrate these two types of learning in a balanced way. It should retain flexibility to utilize any type of learning depending on the actual (i.e., real-world) situation.

4) What is the learning propensity model (LPM)?

It consists of the dynamics as follows. Managers form a particular propensity for either on-shop or off-shop learning to solve operational problems. Following the managers' initial perceived effectiveness, more resources and managerial attention are allocated, and as a result, the initial perceived effectiveness of their chosen learning method becomes a realized effectiveness. Then, the managers formulate a similar strategy to allocate resources in favor of their chosen learning method. The managers' initial learning propensity is thus strengthened and reinforced by positive results from the successive implementation of such approaches. When this learning cycle has repeated for a long time, it will be extremely difficult for the company to change the dynamics. In that case, one of the most effective and promising intervention methods is to tackle the determining factors (i.e., top management, infrastructure, and logistical system).

5) Can you suggest a case to which you can apply the LPM to analyze a managerial problem?

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Students can suggest a case in which a particular learning propensity has been formed in an organization for a long time, and the propensity has been reinforced through resource allocation or determining factors.

IBM is an interesting case. Until facing the drastic IT revolutions in the 1990s, IBM had been the most powerful company in the computing industry, especially in the mainframe computing area. The company had been so much aligned with the mainframe computing that it couldn't adapt to new reality shaped by the IT revolutions such as the PC, the client server, and later the internet in the 1990s. This is a classic case, where a company that has become so strong by developing a particular capability (i.e., learning propensity) eventually faces a catastrophic obstacle (usually caused by huge environmental disruptions such as new IT revolutions) and fails to adapt to the new reality. In order to revive the dying company, IBM had to implement an extreme measure to redirect its determining factors, i.e., hiring a new CEO outside the computing industry.

6) What are the major differences between static and dynamic operations management? Why do you think such differences occur?

Dynamic view regards learning as one of the most fundamental activities in operations, however, static view ignores it. There are many differences between static and dynamic operations that relate to these contrasting positions to learning.

First, the static view assumes that the production technology is well-known and there is one optimal way to do operations, implying no need for learning capability. On the contrary, the dynamic approach views the learning capability as a quintessential part of effective operations management due to uncertainty and advocates firm's effort to manage learning.

Second, the static view considers labor's role to be passive while the dynamic approach suggests that effective learning must be supported by all members in an organization – from field workers, supervisors, R&D engineers, middle managers, to top managers.

Third, the static view assumes a known and stationary environment, however, the dynamic approach suggests that the environment is inherently uncertain.

Finally, the static view considers that the company can define its goal clearly. But the dynamic approach emphasizes refining and adapting its goals dynamically through learning.

7) Define controllability, flexibility, and integrating capability, respectively. Why do you think there is a short-term trade-off relationship between capabilities? Is there such a relationship in the long run? Why or why not?

Controllability is a firm's capability to control its processes so that it can attain an enhanced level of efficiency (e.g., high conformance quality). Flexibility is a firm's capability to deal with uncertainties in the market and increase responsiveness to the changing market. Integrating capability is based on the firm's learning ability. There exists a trade-off relationship between controllability and flexibility in a short-term because critical sources of these two capabilities contradict each other. The key source of controllability is the scale economy and its effect is enhanced operational efficiency, however, the primary source of flexibility is the

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firm's ability to deal with diverse dimensions simultaneously and its effect is superior responsiveness. But a firm can overcome the trade-off relationship in the long-run by firm's integrating capability since the integrating capability can shift the firm's capability curve upward, mitigating the negative impact of the inverse relationship between controllability and flexibility.

8) Explain the concept of chain of capability. In what ways is it different from the horizontal model consisting of controllability, flexibility, and integrating capability?

A chain of capability consists of three capabilities, i.e., basic, process (control), and system capability. The basic capability consists of overall knowledge and experience (e.g., culture, employees' general understanding of production process). The process (control) capability focuses on an individual function and process. The system level capability relates to capabilities such as responsiveness, lead-time, quality, design, and NPD capability that customers can observe. While the horizontal model of capability focuses on fundamental roles played by the capabilities, the vertical perspective on firm's operations capability helps managers understand and reconcile the contrasting relationship between incremental and radical changes in the organization.

9) Define radical and incremental improvements. Which one do you think is more realistic for your (future) business? Explain why.

The incremental improvement relates to small and continuous improvements over time while the radical improvement relates to huge and discontinuous improvements.

10) Explain how you can reconcile the two different improvement patterns by using the chain of capability.

There can be both incremental and radical innovations in an organization. For instance, an accumulation of incremental improvements in basic capability over time can induce radical improvements in process capability.

5. Teaching notes for the cases

1) Case Study 2.1 Global knowledge management at Danone (A) (abridged)

   - Refer to the Teaching Note for Case 2.1

2) Case Study 2.2 Global Capacity Expansion Strategies of Two Korean Carmakers [*Online Appendix 2A*]

   - Refer to the Teaching Note for Case 2.2

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# Teaching Note

# Case 2.1 Global Knowledge Management at Danone (A) (abridged)

## Case synopsis

Danone (http://www.danone.com) was a global food retailer selling a variety of food products such as dairy products and beverages. Danone implemented a concept called the Networking Attitude to accelerate knowledge sharing in a company. This case discusses how Danone managed internal knowledge effectively to respond to the market faster than other larger competitors and what were the challenges faced by the company.

## Suggested assignment questions

We suggest the instructor assigns the following questions or similar ones derived from them.

1. What is your assessment of the company's knowledge management?
2. What are the most important knowledge management challenges faced by the company? What does the company need to do well to succeed?
3. What is your assessment of the Networking Attitude initiative?
4. What should the company do next? Which of the three options (go wider, go deeper, go richer) do you recommend? Why?
5. How does the CEO's approach to leading Danone affect your recommendation?
6. Can you suggest some of the concepts or theories in this chapter, which you can employ to analyze the case? Show how you apply them to the case analysis.

## Case analysis

We expect the students to be able to identify key concepts and theories in the chapters, which directly relate to learning and knowledge management, and apply them to answering the following questions.

1. What is your assessment of the company's knowledge management?

Danone's knowledge management improved learning capability in the company. It specifically focused on creating culture and environment to share knowledge among employees, which makes Danone be a learning organization. By utilizing know-hows and knowledge of employees worldwide, the company was able to understand and solve the operational problems rapidly. This contributed to enhancing the company's competitive advantage by making the company respond to the market quickly than other competitors do.

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2. What are the most important knowledge management challenges faced by the company? What does the company need to do well to succeed?

Although Danone's informal approach to knowledge management fitted well with its decentralized structure and entrepreneur culture, it was not sufficient to manage the knowledge systematically. For instance, relying heavily on the informal knowledge sharing was less effective in certain environments (e.g., time lack, cultural difference). In Danone, there was a lack of formalized tools such as IT systems or incentive mechanisms to support knowledge sharing. Although incorporating formal approaches could have negative impacts on the voluntary knowledge sharing to a certain extent, a proper balance between formal and informal approaches might be necessary to sustain and expand knowledge sharing in the long-term.

3. What is your assessment of the Networking Attitude initiative?

The Networking Attitude was generally successful since it supported the company to have a culture of knowledge sharing. As Mougin mentioned, sharing among employees was not a natural activity and the company had to find a way to encourage people to share. By utilizing various informal social tools (e.g., Marketplace, Message-in-a-bottle) in the Networking Attitude initiative, the company was able to nurture the culture in which the managers work in networks and share knowledge actively. Therefore, the initiative facilitated the company to break silos between employees and to absorb and combine knowledge in the company. But as discussed in Question 2, the initiative can be further supplemented by formalized approaches. Utilizing formalized approaches effectively would be especially necessary if the Networking Attitude initiative is to be expanded (e.g., Deeper, Wider, Richer).

4. What should the company do next? Which of the three options (go wider, go deeper, go richer) do you recommend? Why?

- Deeper: More employees

This option means that the company expands the Networking Attitude internally, including more functions and lower level employees in the company. This option can empower employees, facilitate more cross-functional communications and foster alignment between senior management and employees. But there could be language barriers among employees and the non-managers might not create sufficient value compared to costs for this option.

- Wider: Outside the company

This option means that the company expands the Networking Attitude to supply chain partners, including suppliers, consumers, and retailers. By sharing knowledge with supply chain partners, Danone can solve supply chain problems more efficiently, build stronger relationships with partners and understand the market more deeply. But in order for this option to be successful, the supply chain partners also need to have a culture of information sharing and its benefits should not leak to other competitors.

- Richer: Innovation

This option means that company creates new knowledge, process, or products through the Networking Attitude. By facilitating more innovations, Danone can stay competitive in the market and encourage innovative thinking among employees. But this option should be

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complemented with proper organizational supports (e.g., evaluation and incentive systems) because it requires substantial time and resources of participating employees.

5. How does the CEO's approach to leading Danone affect your recommendation?

In Danone, the CEO maintained decentralization strategy that gave high responsibility to managers. The CEO was also committed to maintaining close touch with local markets, which allowed the company to move quickly. This strategic direction facilitates each of three options. Deeper option can become more important under the decentralization structure because this option facilitates more inter-functional communications. The company's emphasis on marketing and sales with less senior management attention to manufacturing, supply chain and purchasing also makes the deeper option necessary to reduce inter-functional conflicts. Wider option that involves more collaboration with customers is also attractive in that CEO aimed to stay close to local markets. Richer option is also important for Danone because it can lead to more innovations for its products and processes. This can support Danone's competitive strength, which is to respond to changes in the market rapidly.

6. Can you suggest some of the concepts or theories in this chapter, which you can employ to analyze the case? Show how you apply them to the case analysis.

(1) Learning and learning capability (refer to Chapter 2.1): e.g., In what respect would the knowledge management initiatives (e.g., the Networking Attitude) contribute to Danone's learning capability?

- Learning: a process through which a company identifies, analyzes, and internalizes complex cause-and-effect relationships for operations problems.
- Learning capability: an ability to enhance the performance through applying its learning to solving real-world managerial problems.

  By sharing best practices and know-hows on similar issues, employees would be able to identify, analyze and understand the cause-and-effect relationship in managerial problems more effectively. Hence, knowledge management initiatives would increase Danone's learning capability.

(2) Chain of capability (refer to Chapter 2.5.3): e.g., How would the Danone's knowledge management initiatives influence its basic capability, process capability and system level capability?

- The basic capability consists of overall knowledge and experience (e.g., culture, employees' general understanding of production process).
- The process (control) capability focuses on an individual function and process.
- The system level capability relates to capabilities such as responsiveness, lead-time, quality, design, and NPD capability that customers can observe.

  The Networking Attitude initiative was designed and implemented to create a culture of knowledge sharing and change the employees' perceptions on sharing. Therefore, it would improve the basic capability of the company. As knowledge and know-hows are accumulated and shared actively among the employees, they would be able to improve the company's individual process, leading to higher process capability. Continuous improvements in each function and process through knowledge management would then increase Danone's system level capability in the long-term.

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# Teaching Note

# Case 2.2 Global Capacity Expansion Strategies of Two Korean Carmakers

## Case synopsis

This case study was motivated by an empirical observation that two Korean carmakers, Daewoo and Hyundai, despite some of their structural similarities, have pursued very different globalization strategies. As chaebol companies, Daewoo and Hyundai have much in common in terms of structural characteristics: both are highly diversified conglomerates, heavily dependent on debt-financing, and have focused on exporting as their primary growth engines. But they have developed contrasting approaches in their globalization strategies. This case discusses how and why these different globalization strategies have emerged over time based on the global learning propensity model.

## Suggested assignment questions

We suggest the instructor assigns the following questions or similar ones derived from them.

1. Why have the two carmakers evolved so differently?
2. Why is the way Daewoo achieved economies of scale different or unique?
3. What should the CEO at Daewoo have done to prevent the company's collapse?
4. What advice would you give to the CEO at Hyundai for the future?

## Case analysis

We expect the students to be able to identify key concepts and theories in the chapters, which directly relate to learning propensity model, and apply them to answering the following questions.

1. Why have the two carmakers evolved so differently?

Being direct competitors in the Korean automobile industry has affected the firms' globalization strategies to a great extent. Each company took into account its competitive position vis-à-vis the other's when forging its global strategy. For instance, Daewoo focused on expeditiously achieving economies of scale by targeting the East European markets for its overseas capacity expansion, in a way to overcome its manufacturing cost disadvantage in the domestic market vis-à-vis Hyundai's. Likewise, Hyundai's globalization strategy, exporting supported by technological advancement, was driven by an implicit assumption of its competitive advantage vis-à-vis Daewoo's. This initial pattern of decisions was formed mostly by such determining factors as top management's commitment to specific strategic decisions and resources, both managerial and financial, from each company's parent business group;

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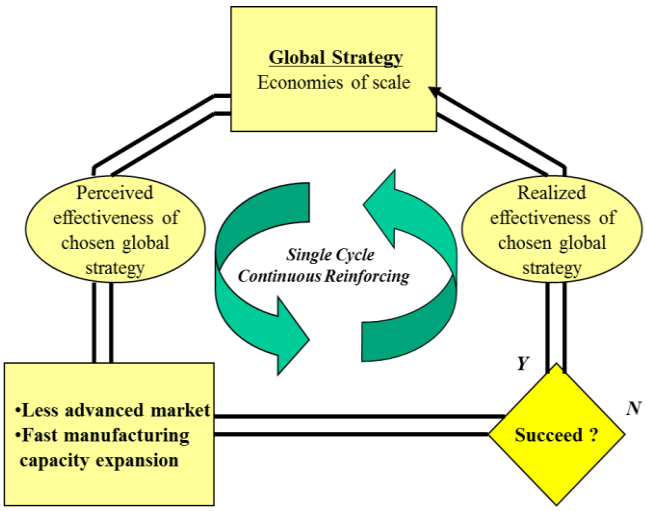
chaebol. Subsequently, it was altered or reinforced as each company accumulated different learning experiences in the global market.

Figure A2.41 shows Daewoo's starting with a globalization strategy to pursue economies of scale, since the company needed to increase its capacity fast in order to overcome its cost disadvantage. Being consistent with the strategy, Daewoo entered Eastern Europe, where it acquired existing manufacturing capacity. During that process, the company seldom encountered any serious difficulty, and that lack of problems reinforced Daewoo's propensity to expand its capacity in the region. It was due to the self-reinforcing and thus accelerating nature of the learning propensity.

Figure A2.41. Global learning propensity dynamics – Daewoo




In contrast, Hyundai showed more complicated dynamics (Figure A2.42). Initially, the company focused on R&D and export. After its first export under its own brand name to the North American market became a success, Hyundai redirected its globalization strategy so as to expand its manufacturing capacity into Canada. This is the first cycle as shown in Figure A2.42. But, its operations in Canada were not successful. From its failed operations in Canada, Hyundai learned a valuable lesson and adopted a more cautious approach to expanding its capacity overseas (second cycle in Figure A2.42). Eventually, Hyundai decided to return to its original globalization strategy: developing technologically independent cars and exporting them to advanced markets. This started the accelerating reinforcement cycle, the third one shown in Figure A2.42.

Figure A2.42. Global learning propensity dynamics - Hyundai

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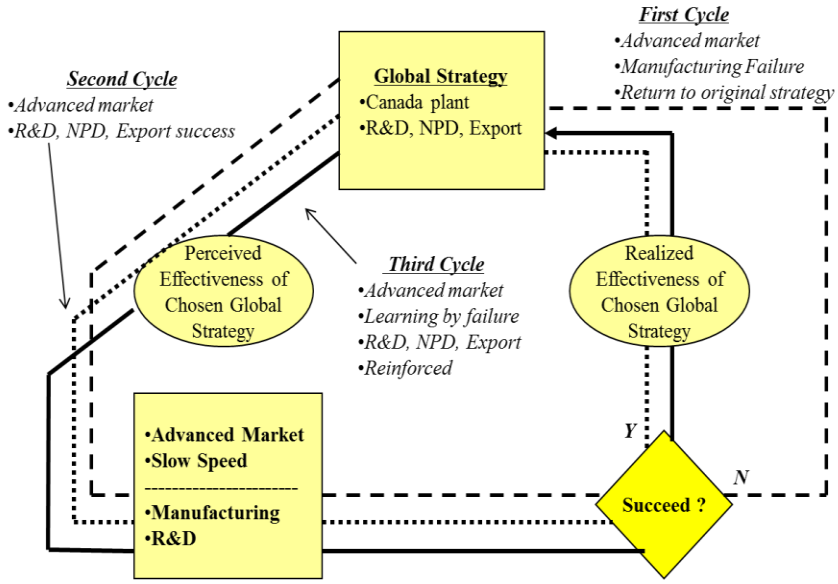


2. Why is the way Daewoo achieved economies of scale different or unique?

Daewoo's economies of scale were initially pursued to overcome its competitive disadvantage in the domestic market. As of 1993, Hyundai enjoyed almost 50% market share in Korea, whereas Daewoo held only 20%. Faced with this hurdle in the domestic market, Daewoo sought other ways to evade this impasse and found globalization to be an answer.

Daewoo's economies of scale through globalization strategy was unique because Daewoo's globalization pace was quite fast: it took less than four years for Daewoo to increase its capacity of foreign operations and marketing, which more than quadrupled. Daewoo's overall capacity expansion occurred in a much shorter period and in a much more dramatic manner than Hyundai's. Daewoo's compounded rate of capacity increase from 1988 to 1997 was about 32%, whereas Hyundai's only 10%. Between 1989 and 1996, Daewoo's foreign production capacity increased from practically zero to more than 1.2 million cars per year, while Hyundai's remained almost unchanged at about 100,000 cars per year.

3. What should the CEO at Daewoo have done to prevent the company's collapse?

Daewoo seldom confronted a serious obstacle during its capacity expansion spree: its experience in overseas capacity expansion was self-reinforcing and accelerating. But as of late 1999, Daewoo went bankrupt mainly due to its debt-financed capacity expansion in Eastern Europe. Many competing explanations are possible. However, if we base our inference on the case studies in this chapter, Daewoo's globalization velocity was well beyond the speed limit set by its organization capability.

The top management at Daewoo should have discerned positive from negative learning, in order not to trap their organization in a vicious self-reinforcing cycle. According to learning propensity model, once a particular type of learning propensity has repeated for a relatively long period of time, it will be extremely difficult for the company to change the dynamics. As in most dynamic systems, the learning propensity model is also affected by such dynamic inertia as chaos, path-dependence, administrative heritage, and so forth. One of the most effective and promising intervention methods is to tackle the determining factors—to modify top management's will, the system's infrastructure or logistical mechanism, and/or other relevant factors of any fundamental belief systems. More ideally, the CEO should have checked

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the validity of its determining factors from time to time when implementing its globalization strategy (refer to Chapter 2.1.3).

4. What advice would you give to the CEO at Hyundai for the future?

After the successful new car development based on its own independent R&D, Hyundai adjusted its globalization strategy and started operating a manufacturing subsidiary in Canada. But, it failed. This experience of failure, i.e., learning from failure, since became a powerful restraint on Hyundai's capacity expansion overseas. Rather, it returned to its early strategy to focus on perfecting technology and exporting.

Although Hyundai's learning from failure experience and adjustment in its globalization strategy has allowed the company to enter into the virtuous cycle so far, the CEO should be cautious that the virtuous cycle can always become a vicious cycle if the environment or market changes. Therefore, the CEO should keep nurturing company's learning capability in order to continuously strengthen its global competitiveness through globalization strategy.

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**Supply Chain Management: A Learning Perspective**

# **Chapter 2** Learning and Learning Perspective

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# Key Learning Points

- Learning in operations is a process through which the company identifies, analyzes, and internalizes complex cause-and-effect relationships among key factors in management.
- Learning capability is the company's ability to enhance its performance through applying its understanding of those cause-and-effect relationships to solving real-world managerial problems.
- Three representative operations or managerial capabilities are controllability (i.e., efficiency), flexibility, and integrating capability.
- There is a tradeoff relationship between efficiency and flexibility.
- It is the integrating capability that enables the company to mitigate the tradeoff.
- Chain of capability postulates that three capabilities, basic – process – system-level capability, are dynamically linked with each other.
- The principle 'chain of capability' helps the manager understand and reconcile the contrasting relationship between incremental and radical changes in the organization.

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# 1. A LEARNING ORGANIZATION'S PERSPECTIVE

- Learning is an essential part of any creative activity.
  - It is also a word many people use for a variety of different purposes and/or in a variety of different contexts.
- We define learning in operations as a process through which the manufacturing system (i.e., a company) identifies, analyzes, and internalizes complex cause-and-effect relationships among key factors in operations.
  - Learning capability is the manufacturing system's ability to enhance its performance in operations through applying its understanding of those cause-and-effect relationships to solving problems in operations (e.g., manufacturing or service management).
- An example in Figure 2.1, where the firm tries to find out why its operations performance is unsatisfactory.

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# 1. A LEARNING ORGANIZATION'S PERSPECTIVE

- 1.1. Single-loop versus double-loop learning
  - Figure 2.2 shows a short-term learning, where the organization tries to fix the symptoms without tackling more fundamental causes of the problem.
  - Figure 2.3 depicts the double-loop learning that is directly attacking the root causes of the problem.
- Integrated learning (Figure 2.4)
  - Should a company direct its effort to single-loop learning only at the expense of double-loop learning, or vice versa?
  - A truly capable company ought to integrate the two types of learning in a balanced way – it should be able to concentrate on either type, alternately depending on the problem context.
  - A capable company should retain flexibility to comfortably engage in any type of learning the context deems.

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# 1. A LEARNING ORGANIZATION'S PERSPECTIVE

- 1.2. Learning propensity model
  - In the mid-1990s, while conducting a comparative study on two shipbuilding companies in Korea,
    - An intriguing observation: despite the fact that the two companies shared much in common in terms of their historical, geographical, and structural characteristics, their strategies to solve operational problems were very different.
    - The research focus shifted from identifying factors for operational efficiency to explaining such a counterintuitive discrepancy between the two firms' learning strategies.
  - Single-loop learning: In Figure 2.5, the cycle of "learning propensity ➔ perceived effectiveness ➔ optimal dynamics (resource allocation and implementation) ➔ realized effectiveness ➔ reinforced learning propensity," which repeats continuously in the short run.

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# 1. A LEARNING ORGANIZATION'S PERSPECTIVE

- 1.2. Learning propensity model
  - Single-loop learning
  - Double-loop learning – the more serious learning cycle of attempting to redirect or modify determining factors
    - Once the single-loop learning has repeated for a relatively long period of time, it will be extremely difficult to change the dynamics by simply attempting to curb the negative single-loop learning process only.
    - It is also affected by such dynamic inertia as chaos, path-dependence, administrative heritage, and so forth.
    - Now, should tackle the determining factors – to modify top management's will, the system's infrastructure or logistical mechanism, and/or other relevant factors of any fundamental belief systems

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# 1. A LEARNING ORGANIZATION'S PERSPECTIVE

- In-depth Concept 2.1: on-shop versus off-shop problem solving

| | On-site (on-shop) approaches | Off-site (off-shop) approaches |
|---|---|---|
| Pros | - System-specific solutions<br>- Utilizing internal expertise<br>- Avoiding leakage of knowledge | - Avoiding interruption of operations<br>- Utilizing wide range of expertise<br>- Developing generalizable solutions |
| Cons | - Interrupting the on-going operations<br>- Solutions with limited applicability | - Difficulty in maintaining fidelity<br>- Excessive lead-time |

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# 1. A LEARNING ORGANIZATION'S PERSPECTIVE

- 1.3. Parsimony versus sufficiency
  - Two conceptual criteria that a CEO can contemplate when thinking about an optimal amount of information for effective decision-making: sufficiency and parsimony.
  - Sufficiency criterion ➔ the CEO must have enough information so that she won't omit any critical factors when making a managerial decision, i.e., the more information the better.
  - Parsimony criterion ➔ since processing information incurs costs, the CEO must utilize as little information as the decision environment permits, i.e., the less the better.
  - In a real-world environment, the CEO should not solely rely on either rule at the expense of the other ➔ Balancing between the two criteria is important (Figure 2.6)

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# 2. LEARNING IN OPERATIONS

- **Operations learning** as the process of
  1. Identifying and understanding the complex cause-and-effect relationship between critical factors in operations
  2. Generating operations knowledge based on that understanding
  3. Applying the knowledge to solving problems in operations to enhance the operations performance and to further improve the capability of identifying and understanding the cause-and-effect relationship.

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# 2. LEARNING IN OPERATIONS

- Key components.
  - Learning is a process
  - Understanding the complex cause-and-effect relationship Generating operations knowledge
  - Applying the knowledge to solving operations problems
  - Improving performance and capability
- Figure 2.7 depicts the learning process
  - A closed loop comprised of continuous feedback interactions
  - It itself consists of successive cause-and-effect relationships

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# 3. DYNAMIC OPERATIONS AND KNOWLEDGE DEVELOPMENT

- Figure 2.9: a static versus dynamic view of operations management*

| *Static OM* | *Dynamic Approach* |
|---|---|
| • Known production technology; no need for internal organizational learning or research; "one optimal way" | • Knowledge not consumed by use; not automatically generated by experience ⇒ need to manage/control |
| • Labor's role: performing procedures; 'procedure'=defined set of actions; management=specify procedure and monitor | • Learning must be intertwined with production |
| • Known and stationary environment; product markets, input markets, workers, machines=deterministic + unchanging | • Contingencies due to gaps in knowledge about the internal and external world |
| • Homogeneous inputs: labor, raw materials, ……; standardized and available in complete markets | • Problem solving: fundamental in OM; identify and solve the problems that lead to pinpoint contingencies; implications for control = focus on contingencies and related problems |
| • Known goal/purpose/objective function: well-defined | |

* Jaikumar, R. and R. E. Bohn (1992). A dynamic approach to operations management: An alternative to static optimization. International Journal of Production Economics, 27 (3), 265-282.

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# 4. LEARNING PROPENSITY MODEL II

- Figure 2.5 shows the learning propensity model (LPM) ➔ based on it, we further developed LPM II (Figure 2.10)
  - LPM II has a formal mechanism to evaluate the validity of the current learning (i.e., dynamics of the original learning propensity) and thus to enable the company to decide whether to halt an undesirable dynamic or vicious circle.
  - It provides the company with flexibility in sustaining its learning process; far easier to brake a vicious cycle before than after it is solidly formed; preemptive intervention costs much less than ex post fixing.
  - By changing the course of a potentially damaging propensity among its managers, the company increases its chance to learn in the right direction.
  - How to determine whether a certain learning propensity would be eventually helpful or detrimental to the company ➔ to learn how to learn in a simulated, as well as actual, environment; a constant learning-and-updating process

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# 4. LEARNING PROPENSITY MODEL

- **Learning and SCM:** Why and how learning is related to supply chain management?
  - Coordination between strategic supply chain partners is the key to successful implementation of various initiatives for effective SCM and such coordination cannot be forged without mutual learning between the partners.
  - Building a relationship that facilitates the coordination between strategic partners is the process of learning, learning from each other as well as learning how to solve supply chain problems together more effectively.

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# 5. SCM AND OPERATIONS CAPABILITY

- The company should have strong operations capabilities in order to implement its supply chain strategy effectively.
- Two perspectives , horizontal and vertical, that help us understand essential characteristics of operations capability.

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# 5. SCM AND OPERATIONS CAPABILITY

- 5.1. Horizontal perspective: controllability, flexibility, and integrating capability
  - Three representative capabilities: controllability (i.e., efficiency), flexibility, and integrating capability
  - Controllability: ability to control the firm's processes so that it can attain an enhanced level of efficiency, e.g., to achieve a high conformance quality
    - One important source of controllability ➔ economies of scale
  - Flexibility: ability to be nimble to deal with uncertainties in the market
    - Essence of flexibility is "responsiveness" to diverse market demands.
  - Important for the firm to have both controllability and flexibility: to be competitive in the market, the firm needs both efficiency and responsiveness at the same time.
    - But, there exists an inverse relationship between controllability and flexibility. (Figure 2.11)

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# 5. SCM AND OPERATIONS CAPABILITY

- 5.2. Effects of integrating capability on the tradeoff
  - Integrating capability: ability for the company to shift its capability curve so as to mitigate the tradeoff between controllability and flexibility (Figure 2.11)
  - Long-term dynamics
    - Possible to improve controllability (efficiency) and flexibility simultaneously by developing integrating capability
    - Example: BMW case in Figure 2.12 ~ 2.14
  - Caveat: although in the long-run the company can overcome the tradeoff between capabilities as long as it enhances its integrating capability, that doesn't mean that the company can ignore the short-term tradeoff completely.
    - Unless the company deals with the short-term tradeoff successfully, it might not be able to improve its integrating capability in the first place.
    - Not whether to manage both short-term and long-term capability dynamics, but how to balance both dynamics optimally

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# 5. SCM AND OPERATIONS CAPABILITY

- 5.3. Vertical perspective: chain of capability – basic, control, and system capability (Figure 2.16)
  - Chain of capability
    - Basic capability: consisting of the most elementary knowledge and skills a company must have, e.g., employees' general understanding of production processes, quality, safety, quantitative skills, economic and engineering concepts, and cultural aspects
    - Control (or process) capability: coupled with a particular process or processes, more focused and clearly attached to a certain process or processes, "less general"
    - System capability: company's capacity to meet the customers' demands for the attributes of the final products such as high quality, diverse product lines, high delivery speed, and responsive after-sales services
  - Interrelationship between capabilities
    - The company can expect to have a satisfactory level of system capability only when its control capabilities for the production processes are well developed, which in turn need to be firmly based on the basic capability.

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# 5. SCM AND OPERATIONS CAPABILITY

- 5.4. Incremental versus radical improvement
  - Conflict between radical and incremental improvement?
  - An integrated framework to reconcile the potential conflict
    - There are both incremental and radical elements in a company's innovation or improvement dynamics (Figure 2.18)
    - Since it takes a long-term, sustained effort to build basic capability, the company might observe only "incremental improvement" in basic capability over time.
    - An accumulation of incremental improvements in basic capability will help the employees enhance their process or system capability in a discontinuous, radical manner.
  - The more critical issue is not whether a company focuses more on a particular type of improvement, but on how it harmonizes the two different types of improvement in order to optimize its operations performance

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# Discussion questions

1. Can you define a learning organization?
2. Why is it important to take a learning perspective in studying supply chain management?
3. Explain and compare single-loop and double-loop learning.
4. What is the learning propensity model (LPM)?
5. Can you suggest a case to which you can apply the LPM to analyze a managerial problem?
6. What are the major differences between static and dynamic operations management? Why do you think such differences occur?
7. Define controllability, flexibility, and integrating capability, respectively. Why do you think there is a short-term tradeoff relationship between capabilities? Is there such a relationship in the long run? Why or why not?
8. Explain the concept of chain of capability. In what ways is it different from the horizontal model consisting of controllability, flexibility, and integrating capability?
9. Define radical and incremental improvements. Which one do you think is more realistic for your (future) business? Explain why.
10. Explain how you can reconcile the two different improvement patterns by using the chain of capability.

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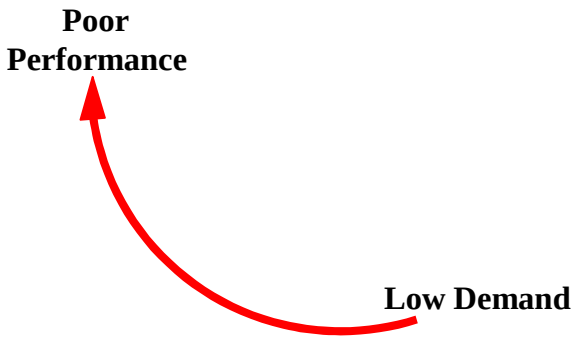
# **Figure 2.1** Example of cause-and-effect analysis for learning

**(a)**

**Poor Performance?**

**(b)**



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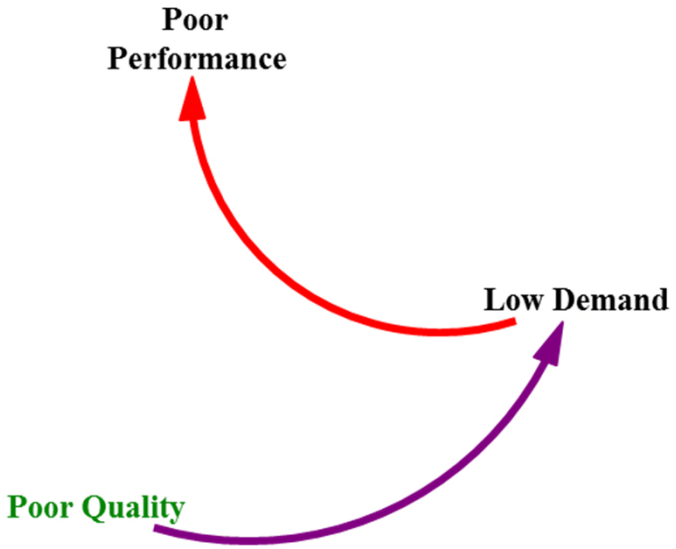
# **Figure 2.1** Example of cause-and-effect analysis for learning

**(c)**



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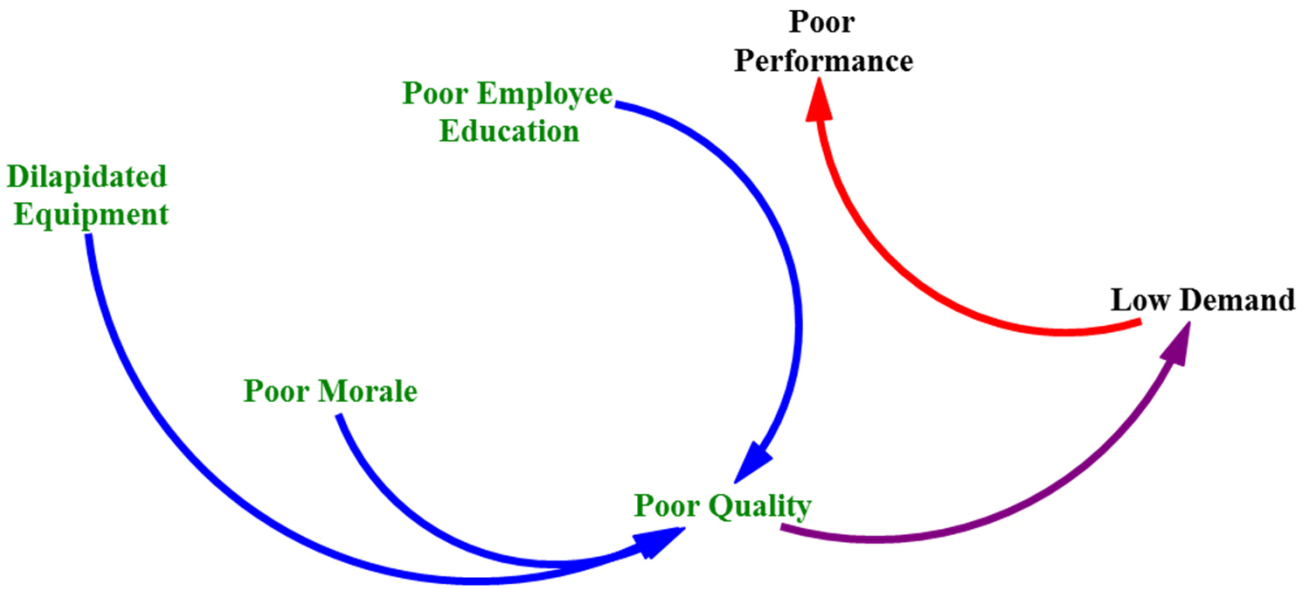
# **Figure 2.1** Example of cause-and-effect analysis for learning

**(d)**



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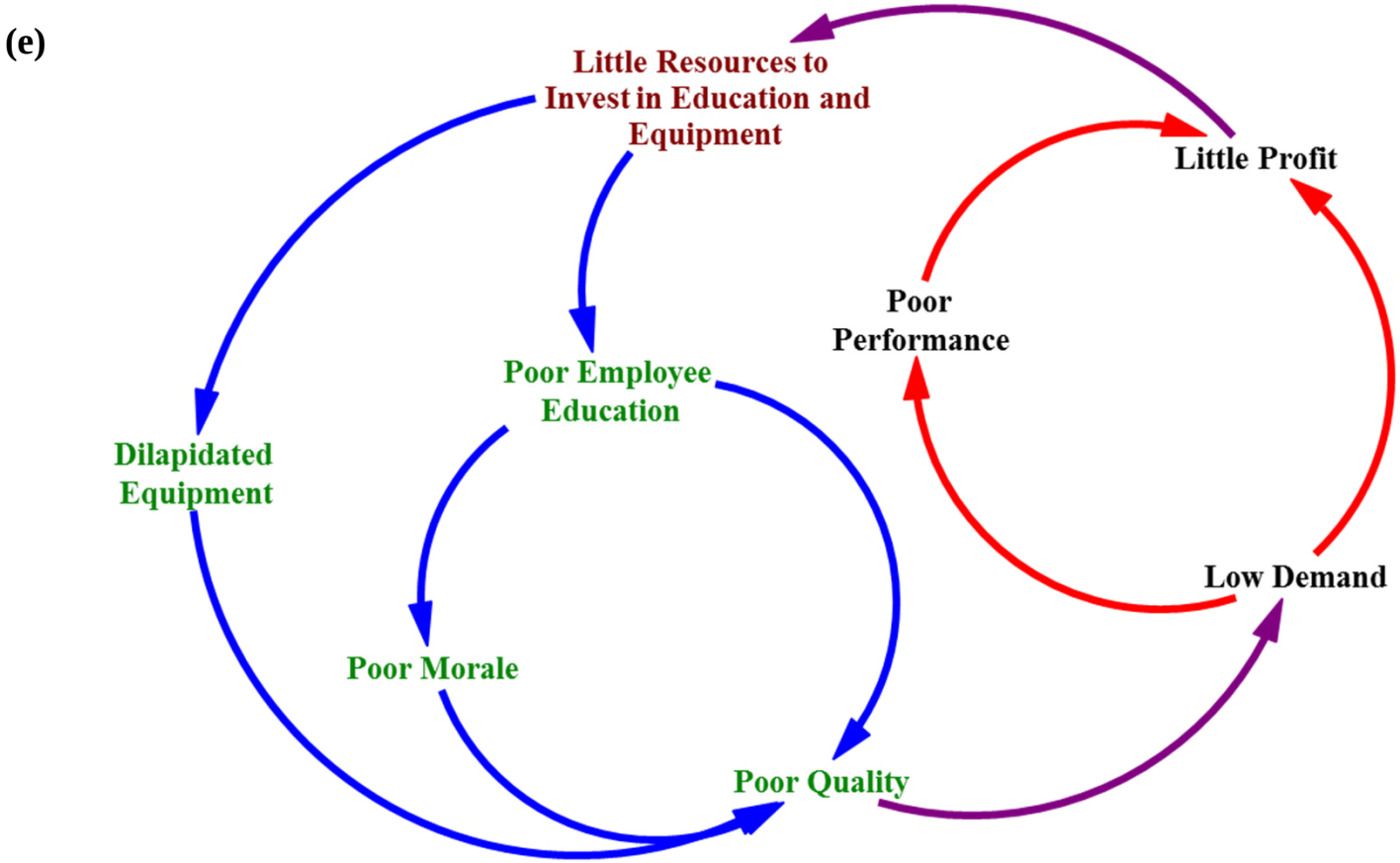
# **Figure 2.1** Example of cause-and-effect analysis for learning



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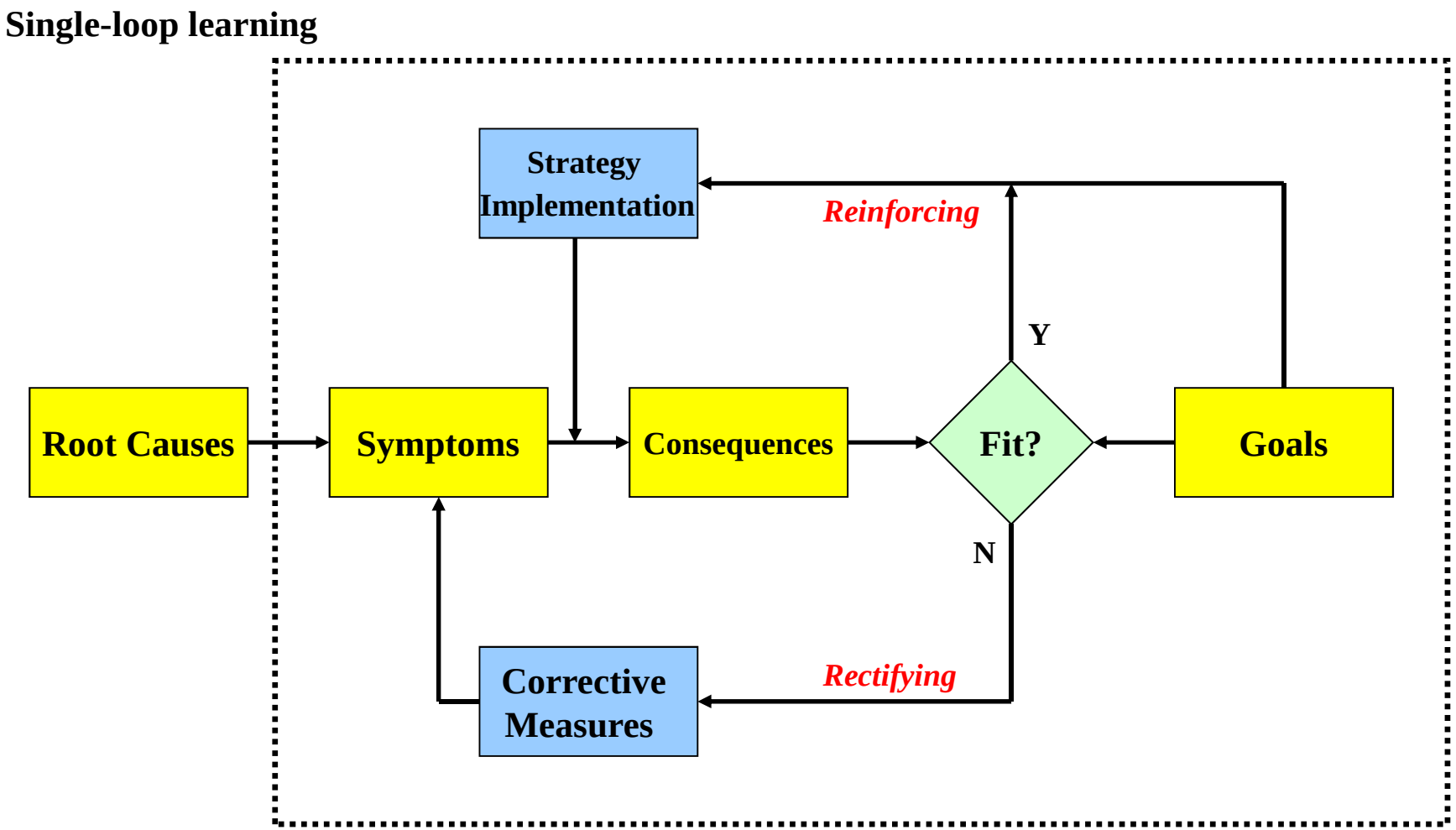
# **Figure 2.2** Single-loop learning



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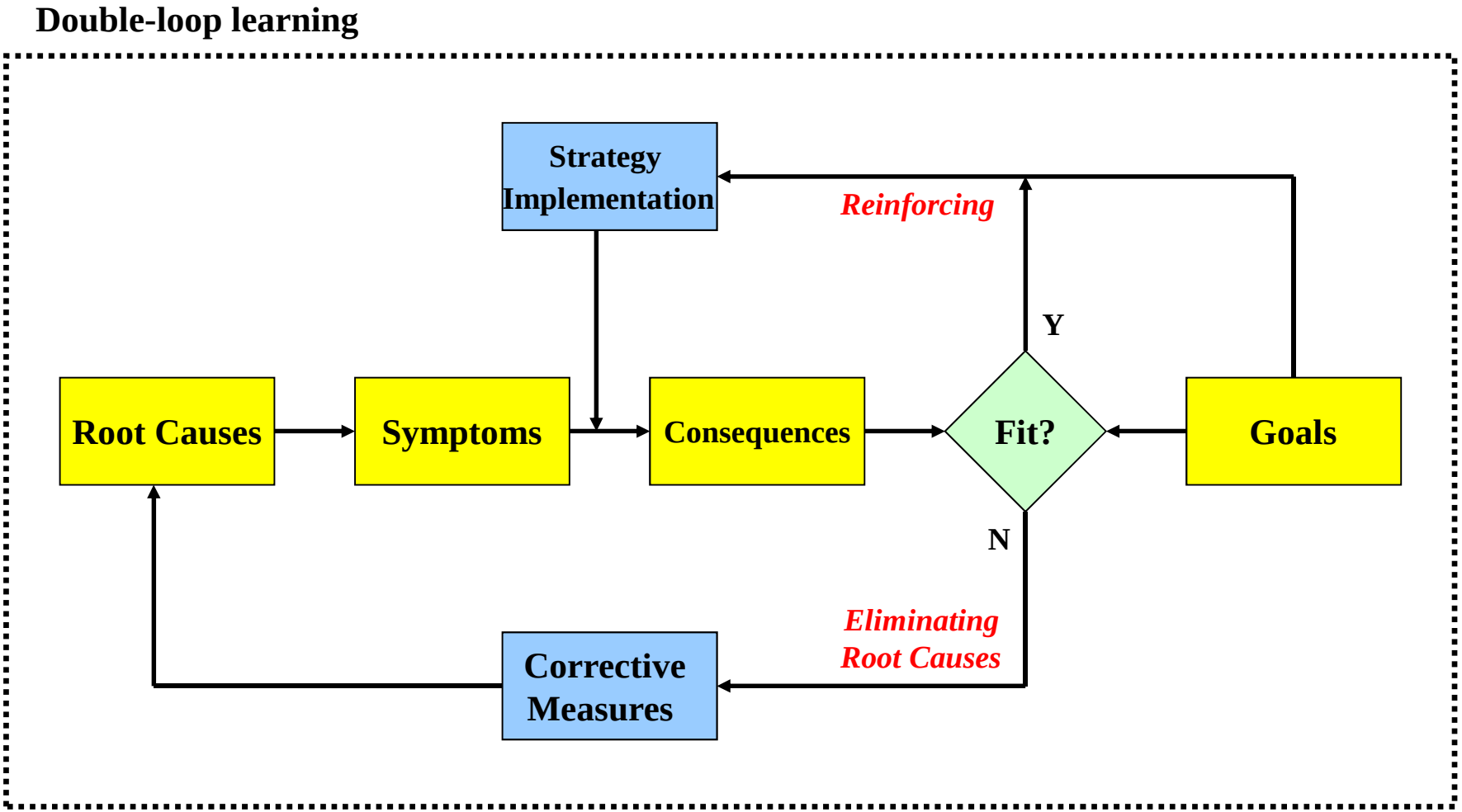
# **Figure 2.3** Double-loop learning



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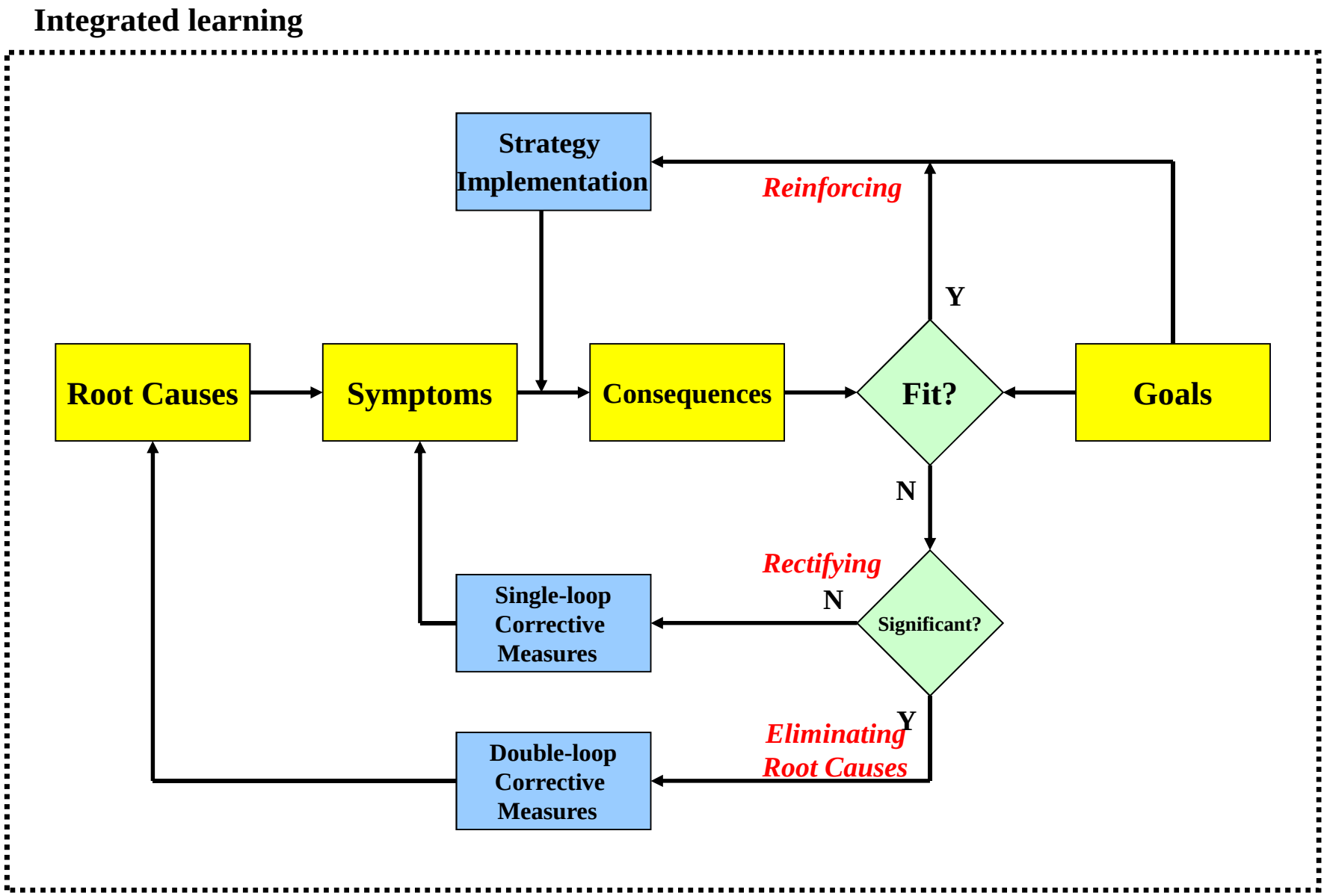
# **Figure 2.4** Integrated learning



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# **Figure 2.5** Learning propensity model (LPM)

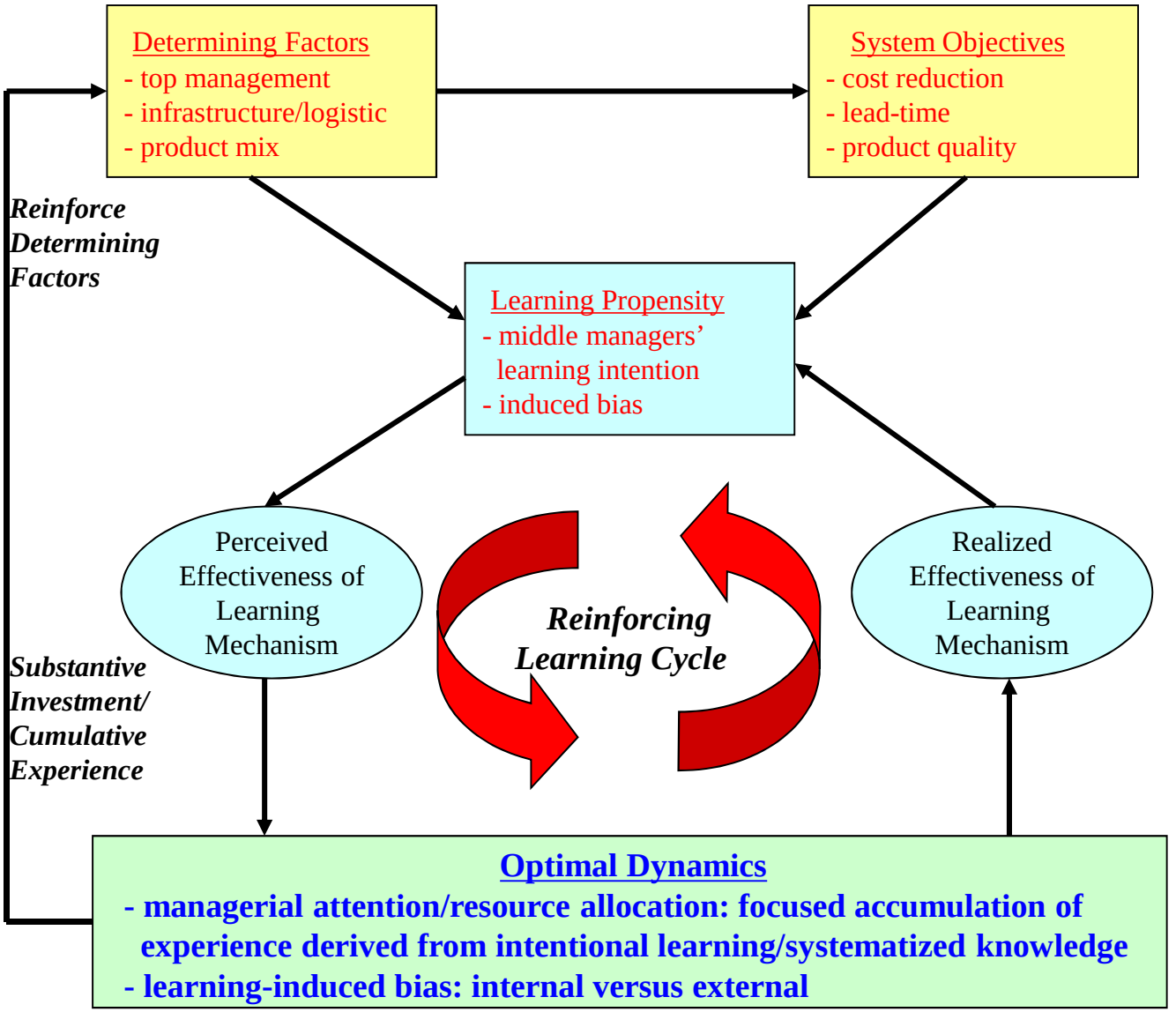

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**Table 2.1** Pros and cons of on-site versus off-site learning approaches

| | On-site (on-shop) approaches | Off-site (off-shop) approaches |
|---|---|---|
| Pros | - System-specific solutions<br>- Utilizing internal expertise<br>- Avoiding leakage of knowledge | - Avoiding interruption of operations<br>- Utilizing wide range of expertise<br>- Developing generalizable solutions |
| Cons | - Interrupting the on-going operations<br>- Solutions with limited applicability | - Difficulty in maintaining fidelity<br>- Excessive lead-time |

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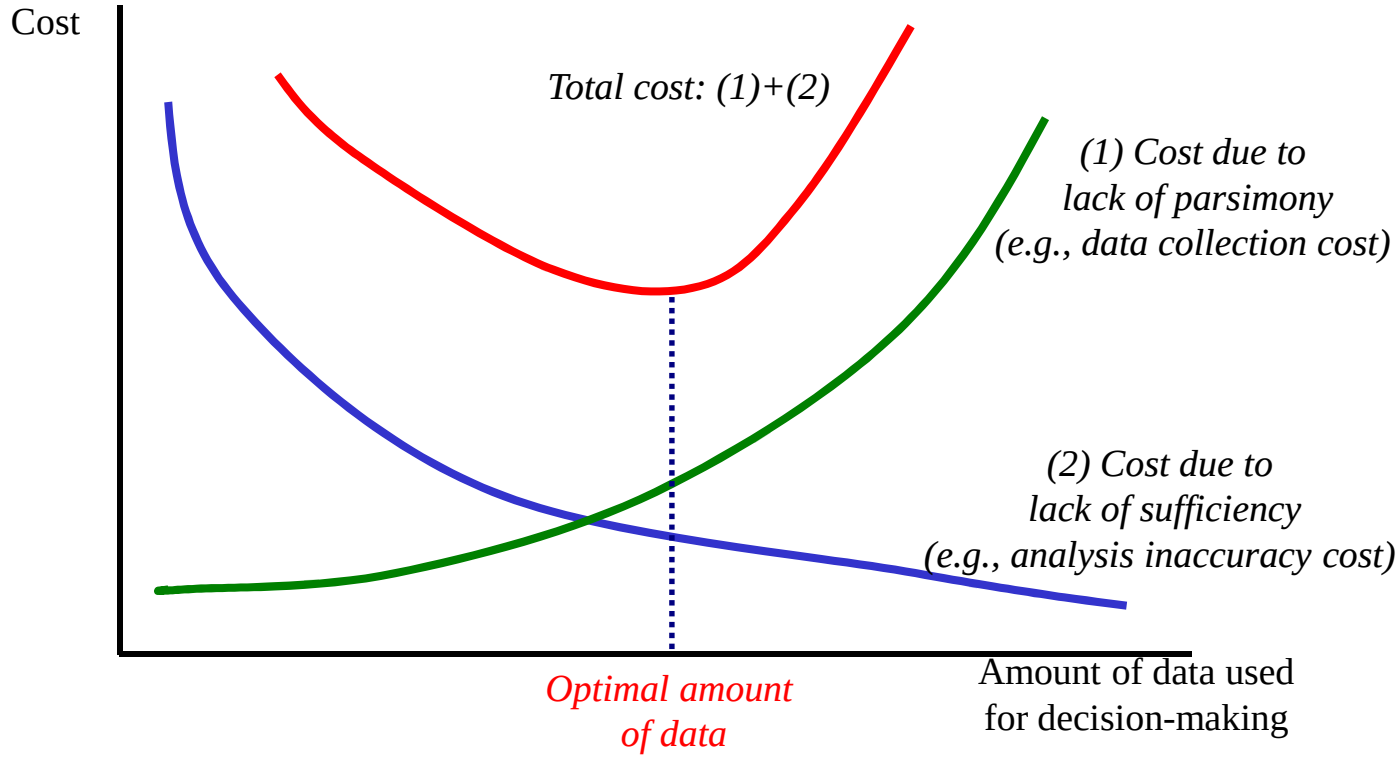
# **Figure 2.6** Parsimony versus sufficiency



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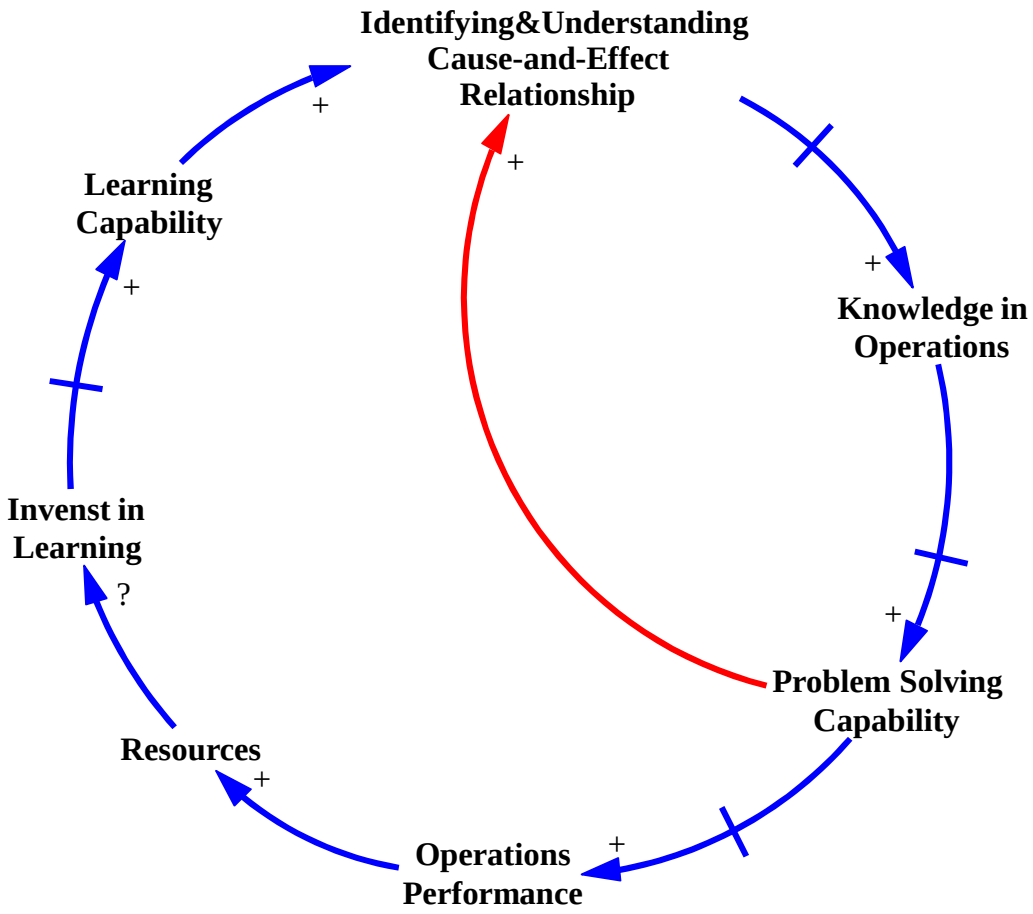
# **Figure 2.7** Operations learning



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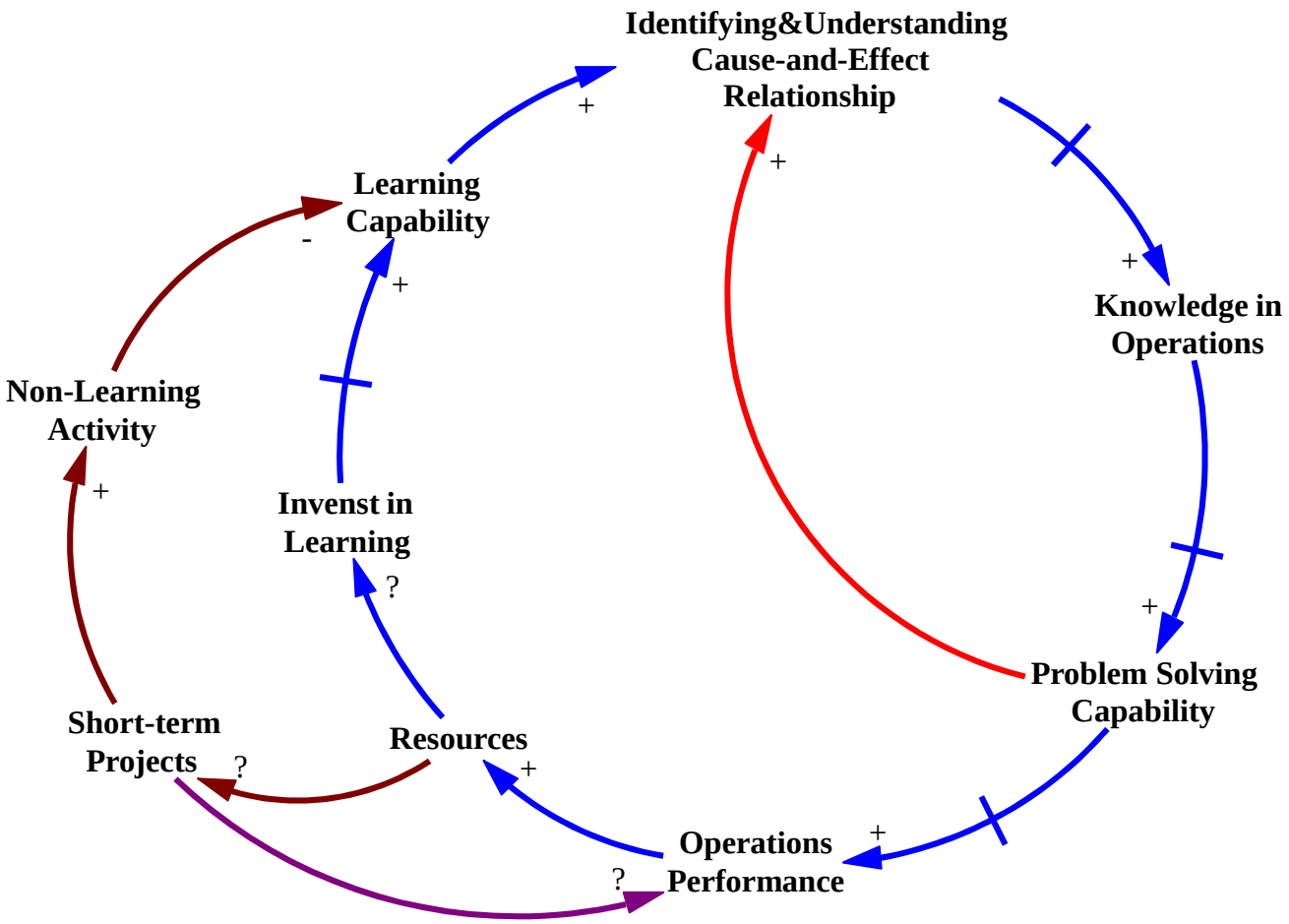
# **Figure 2.8** Operations learning and competing alternatives



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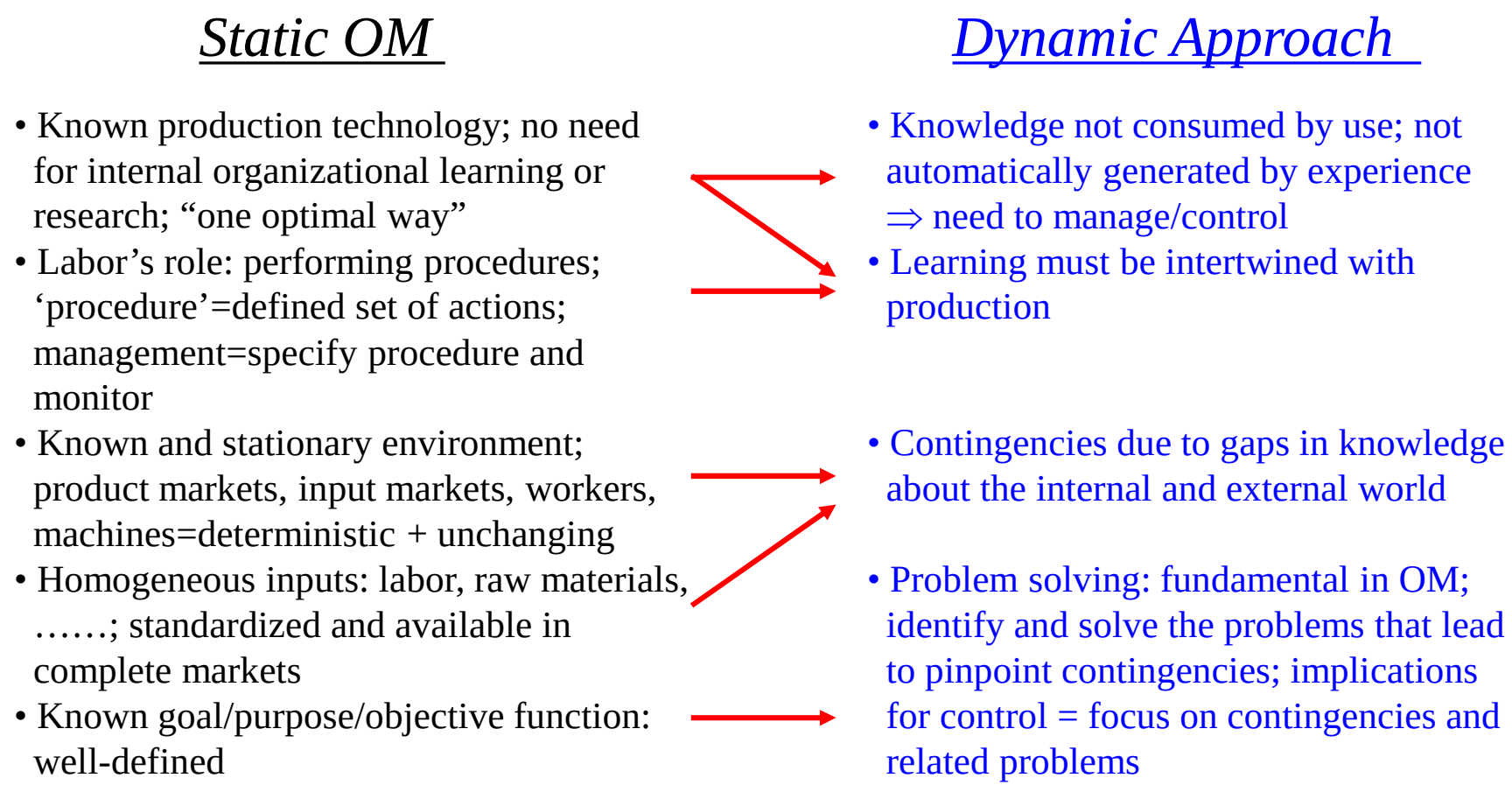
# **Figure 2.9** A static versus dynamic view of operations management



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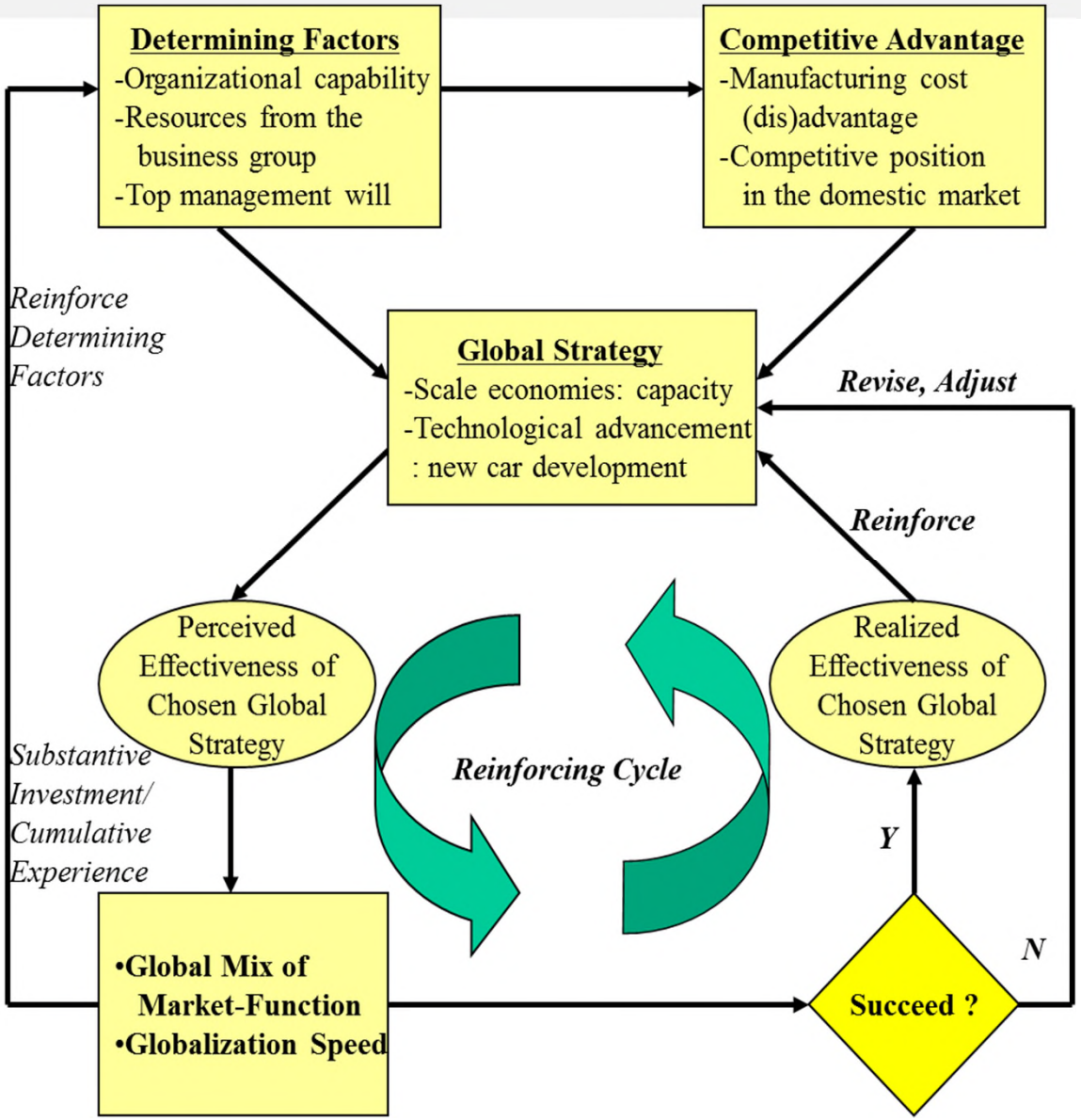
# **Figure 2.10** Global learning propensity dynamics – LPM II



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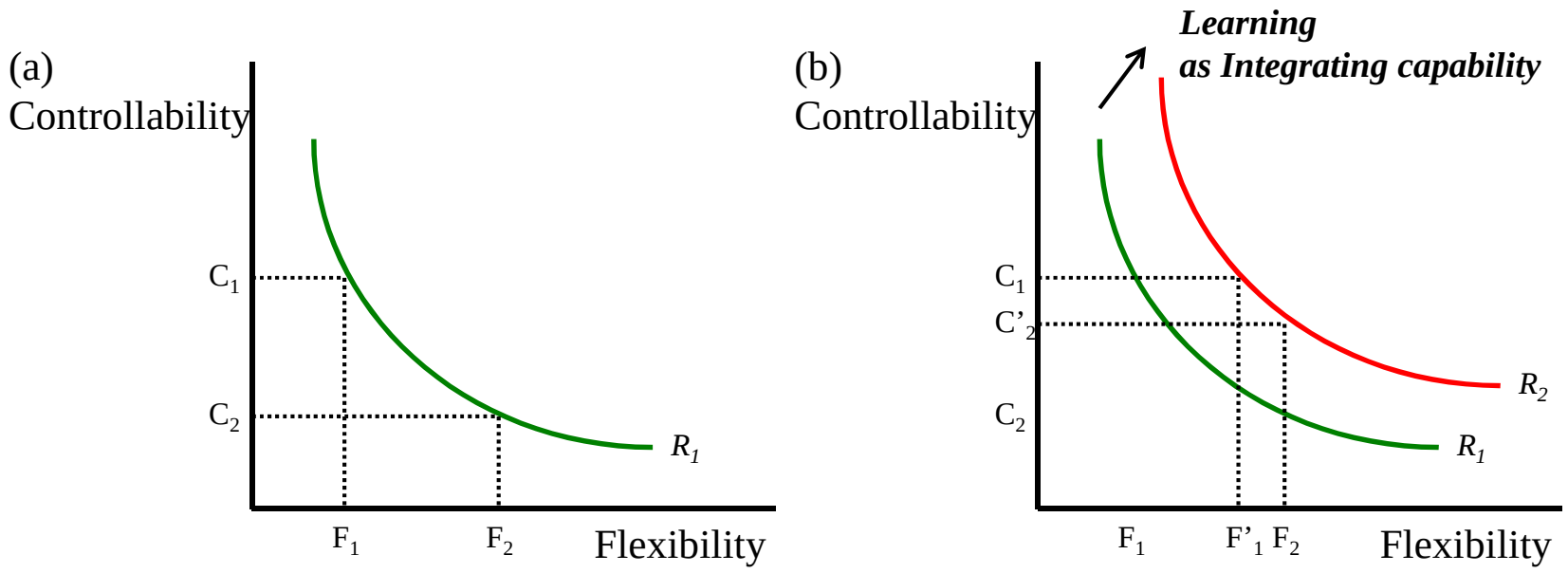
# **Figure 2.11** Controllability, flexibility, and learning capability



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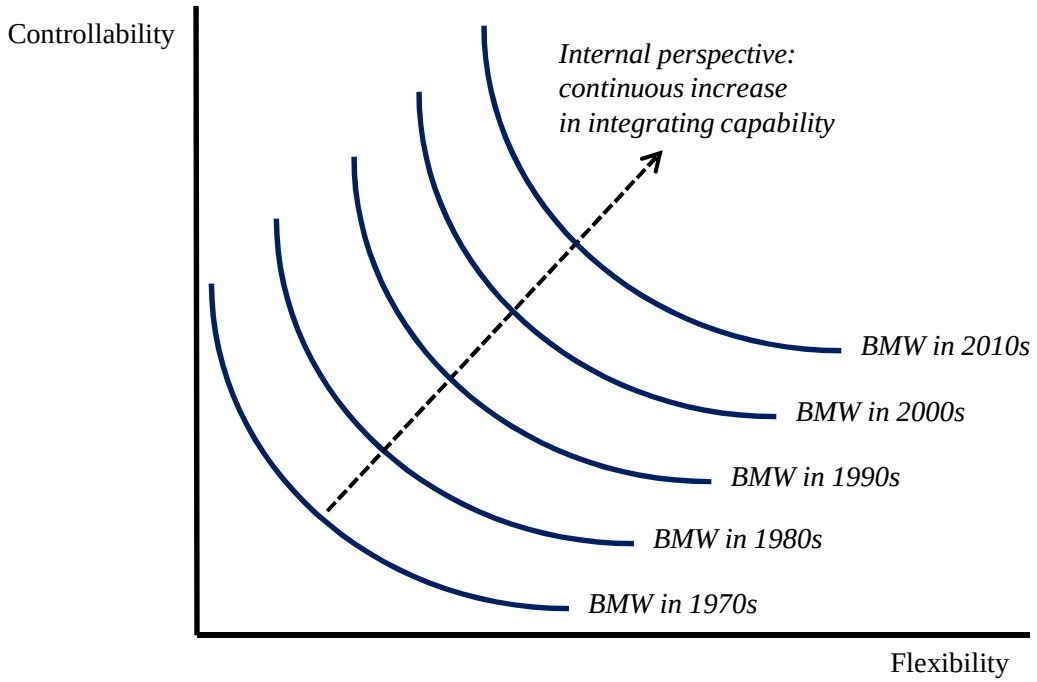
# **Figure 2.12** BMW capability curves



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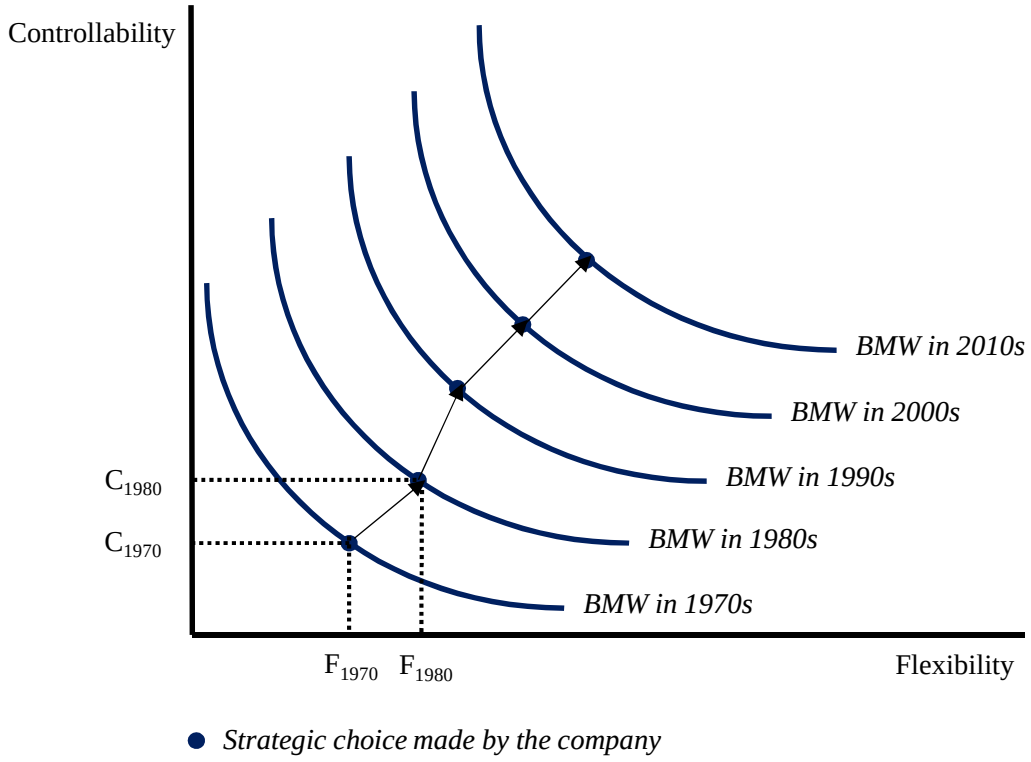
# **Figure 2.13** BMW capability choices



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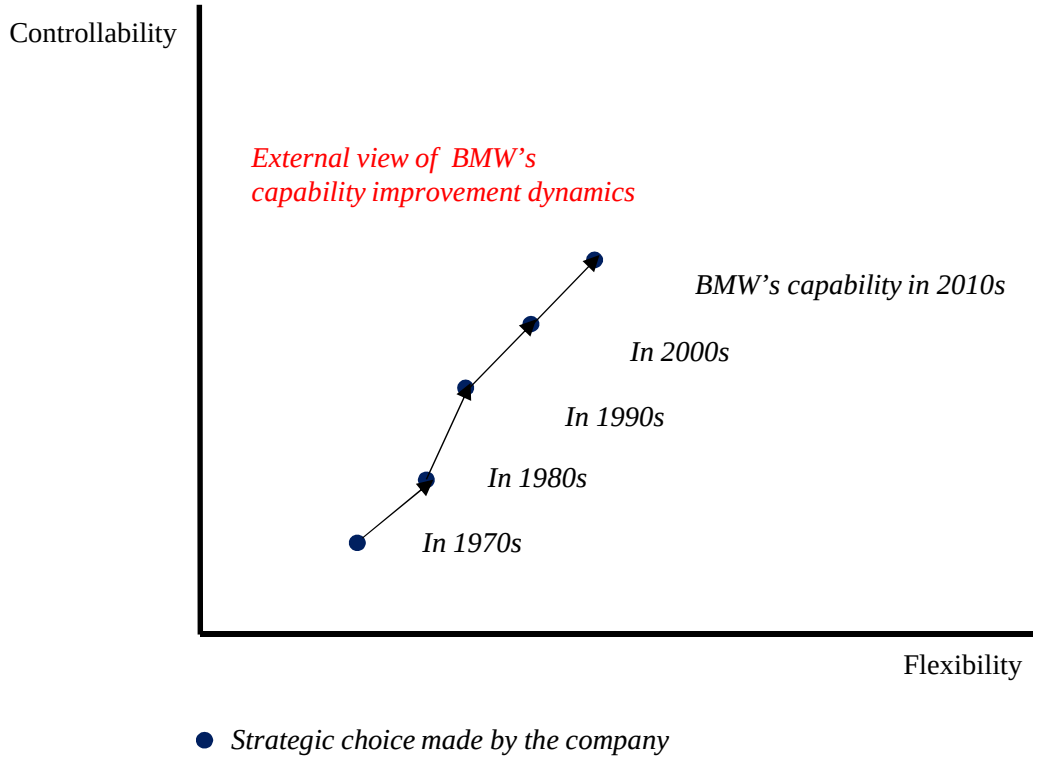
# **Figure 2.14** External view of BMW capability improvement



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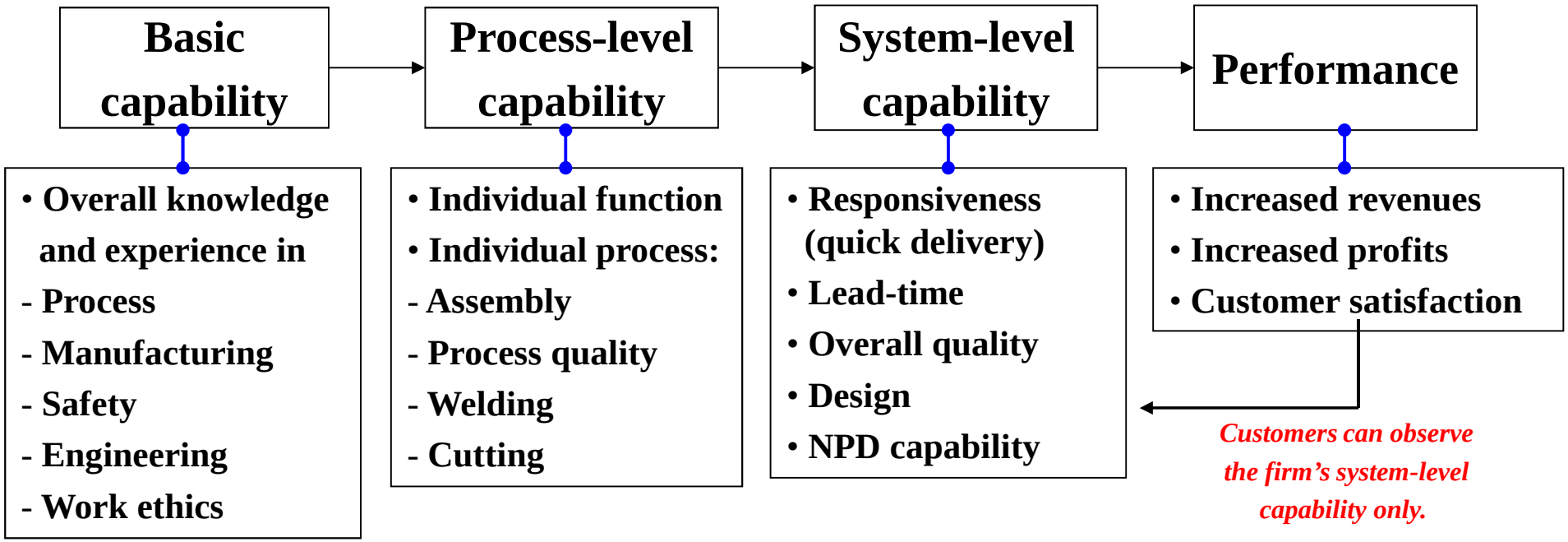
# **Figure 2.15** Chain of capability



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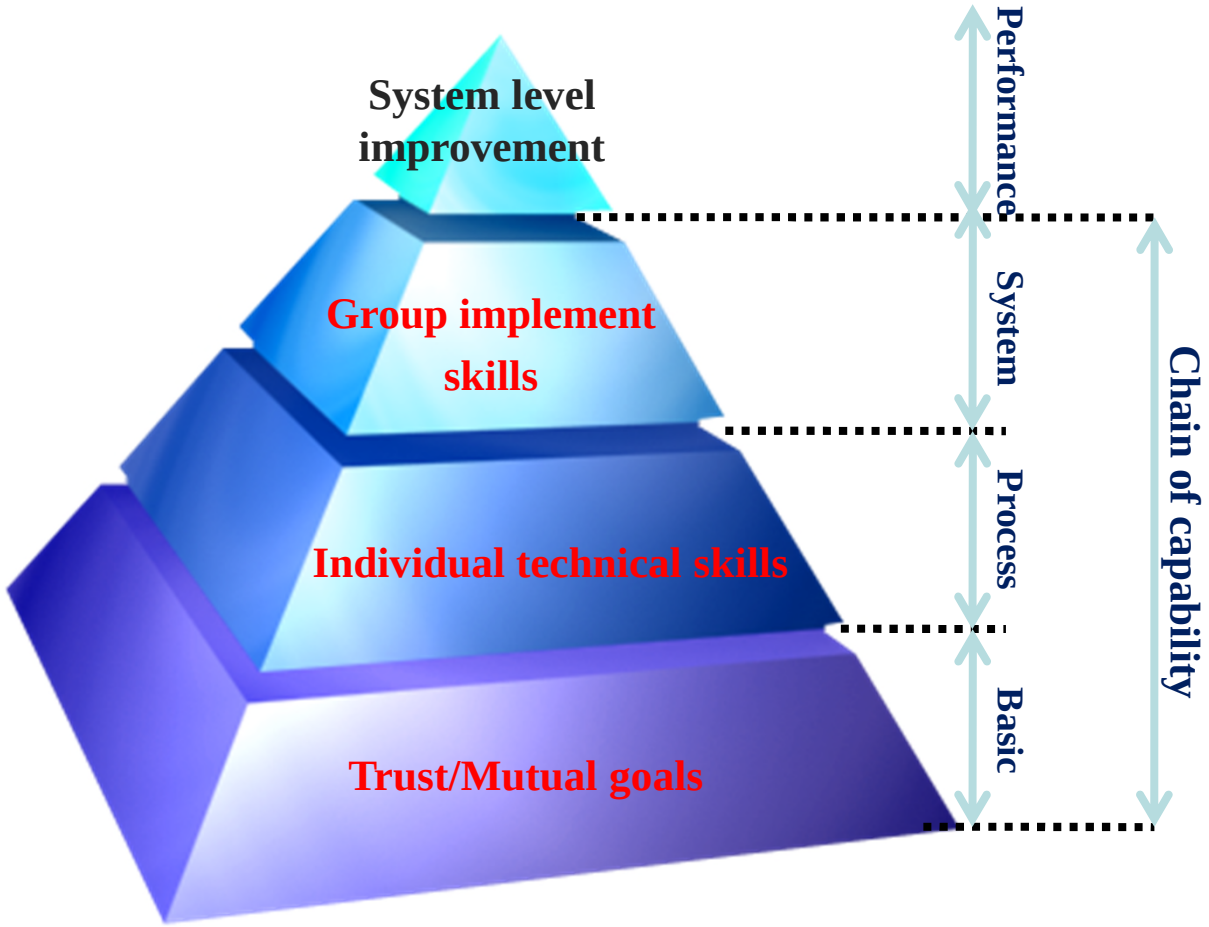
# **Figure 2.16** Hierarchical structure of capabilities



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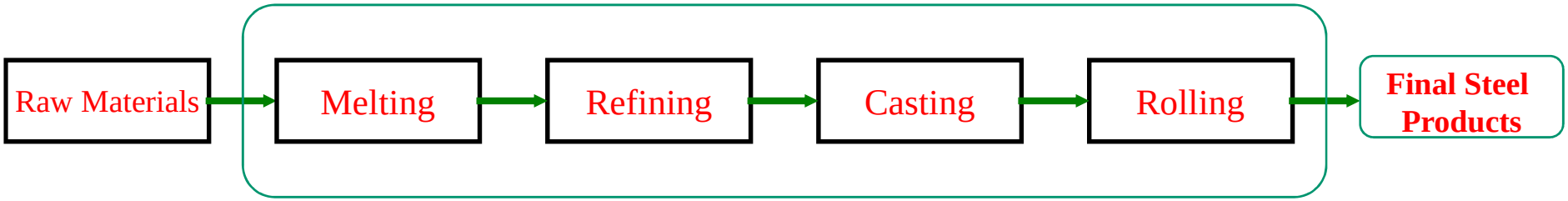
# **Figure 2.17** Production process at a steel company



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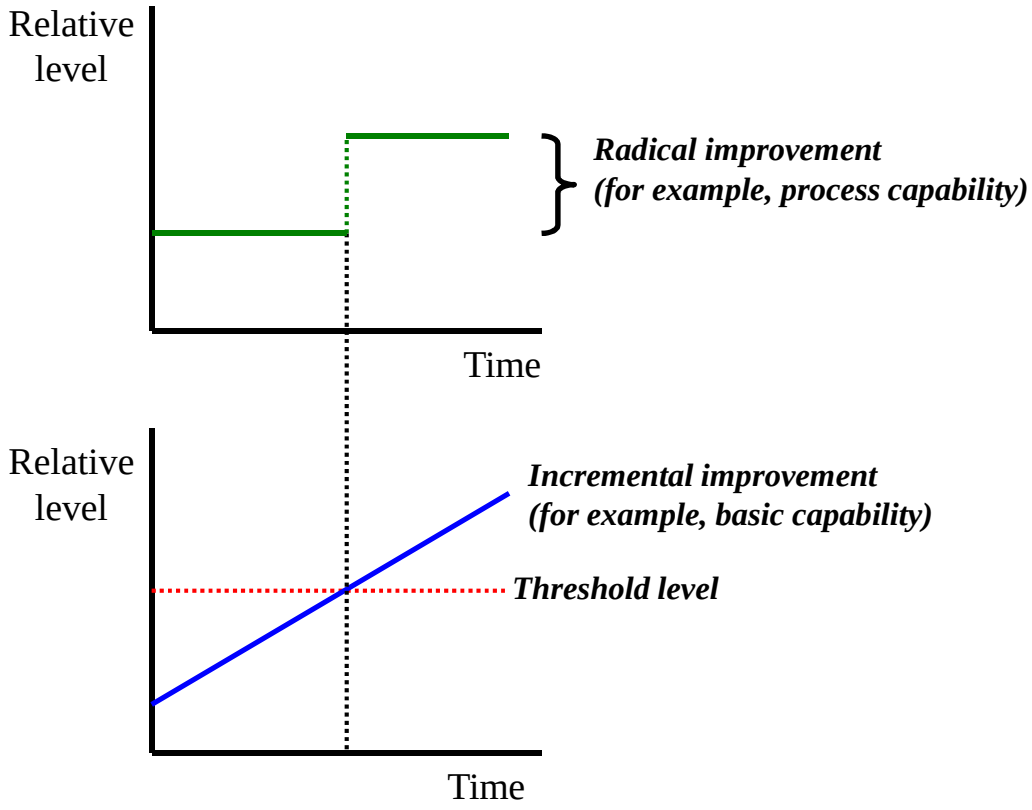
# **Figure 2.18** Incremental versus radical improvement



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# Supply Chain Management: A Learning Perspective

# **On-Line Chapter 2** Learning and Learning Perspective

Professor Bowon Kim
KAIST Business School

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# 1. HORIZONTAL VERSUS VERTICAL PERSPECTIVE ON CAPABILITIES

- Figure A2.22 shows where in the production process each of the capabilities is relevant, while Figure A2.23 depicts another "chain relationship" among the capabilities.
  - Firm must first develop its basic capability, which will support both control and system capability.
  - Supported by basic capability, control capability is associated with individual processes.
  - Company's system capability is the one the market will observe and evaluate, and it can be forged only when the company is able to integrate control capabilities from the entire organization's perspective.
- Regarding applicability, basic capability is the most open to generalization, since its knowledge and skills are so general as to be useful for a wide variety of processes.
- Regarding the decision time horizon, basic capability requires the longest perspective in that it takes time for the company's employees to acquire basic knowledge and skills and also also because the basic capability needs the most comprehensive bases for individual learning.

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# 2. THE DYNAMIC VIEW OF LEARNING PROCESS

- The dynamic view of operations learning based on and consistent with the principles of the dynamic approach to operations management (Figure A2.24)
  - First, the production system sets up its goal grounded on and bound by its current level of knowledge, incomplete and/or uncertain
  - Then, the production system starts manufacturing products through its processes.
  - But, its control over its production processes incomplete and the outcome uncertain.
  - There exists a gap between the realized outcome and the goal set up by the production system. The realized outcome is governed by the complete knowledge, whereas the goal is based on the firm's incomplete knowledge about the production processes.

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# 2. THE DYNAMIC VIEW OF LEARNING PROCESS

- Direct learning
  - The gap plays an important role in operations learning ➔ enables the decision-maker (DM) to identify crucial contingencies in operations
    - The DM must define substantive problems in the production processes and try to solve them by using the system's learning capability.
    - Once the problem-solving activity is completed, it contributes to enhancing the firm's learning capability.
- Indirect learning
  - Production system can pro-act by designing an artificial problem in operations.
    - It reviews its past experience in operations – near-miss disasters – reconstructs the environment so that it mimics where the experience actually happened, and simulates it to do scenario analyses.
    - The firm, or the production system, can learn from its simulation results.

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# 3. THE STAGES OF KNOWLEDGE

- Eight stages of knowledge development (Figure A2.25)
  - 1st stage: the firm is capable of recognizing the difference between good and bad output, although it might not have a clear idea of how it can recognize this
  - 2nd stage: the firm begins to recognize key dimensions – variables, of the output. At this stage, the firm becomes able to understand the basic factors that determine whether the output is good or bad
  - 3rd stage: the firm becomes capable of understanding the relevance of the variables to the output
  - 4th stage: the firm becomes able to measure the variables, i.e., it can quantify the key dimensions of the output

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# 3. THE STAGES OF KNOWLEDGE

- Eight stages of knowledge development (Figure A2.25)
  - 5th stage: the firm must be able to adjust, or control, the variables
  - 6th stage: the firm now must be able to quantify the cause-and-effect relationship between the variables and the output
  - 7th stage: the firm gradually recognizes that the primary variable is not one-dimensional, it consists of secondary variables
  - 8th stage: the firm now has complete knowledge about its production processes; in reality, it is just an ideal condition that the firm can never reach. Now move to 1st/2nd stage.
- *Learning is a continuous process.*

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# 3. THE STAGES OF KNOWLEDGE

- Relationship between knowledge stages and management approaches (Figure A2.26)
  - As the firm's knowledge stage advances, it accumulates more objective data and information about the production system's behavior.
  - At a higher stage of knowledge development, it is better for the firm to make use of the structured approaches of control and management.
  - On the contrary, when the knowledge stage is low, the firm probably would have to take up the more unstructured approach to problem-solving.

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# 3. THE STAGES OF KNOWLEDGE

- How is our understanding of the knowledge stages related with SCM?
  - The core of effective SCM is coordination among supply chain partners is the core. Coordination is related with operations problem-solving that requires intensive attention from the supply chain partners.
  - Should the supply chain knowledge stage be low, the decision-maker probably has to utilize more unstructured approaches, which might have to be based on consensus among the supply chain partners.
  - On the other hand, if the supply chain knowledge level is relatively high due to an extended length of the supply chain relationship, the decision-maker had better take up more structured or formalized tools to control and manage the coordination process.

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# 4. THE LEARNING ALGORITHM

- It is important for the firm to effectively manage the learning process since the learning in operations is critical to enhancing the firm's overall capability and implementing coordination in the supply chain.
- "How can the firm learn?"
  - To postulate a learning model that consists of three building blocks: learning circumstance, learning preliminary, and learning algorithm (Figure A2.27)
- The primary objective of operations learning is to control the production process better – to enhance the firm's process controllability.
  - To reduce the process deviation continuously over time

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# 4. THE LEARNING ALGORITHM

- **Learning circumstance**, underpinning the entire learning process, designates the basic conditions for effective learning in operations.
  - The first element – the synchronous operations systems
    - Consistent with principles of the pull system – a process of the synchronous operations system produces a product only when its immediate downstream process demands the product.
    - In theory, all the processes in the synchronous operations system operate in exactly the same time intervals; that is, in perfect synchronization.
    - Then, it becomes possible to identify serious problems in the production system ➔ identifying the contingencies – significant operations problems – is the first step toward operations learning.

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# 4. THE LEARNING ALGORITHM

- **Learning circumstance**
  - The second element – the contingent inventory system.
    - When the false alarms are mingled with legitimate signals about significant problems in operations, it becomes very difficult to learn efficiently.
    - As such, the contingent inventory system is better than the pure pull system when it comes to operations learning, acting as a mechanism to initiate the learning process.
  - The third element – the effective inspection resource allocation, which should support the firm's contingent inventory system
    - The contingent inventory system assumes 100% inspection throughout the production process ➔ how to allocate inspection resources appropriately is a relevant issue for the learning circumstance.

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# 4. THE LEARNING ALGORITHM

- **Learning preliminary**, supported by the learning circumstance, enables the decision maker to figure out when to engage in the learning process.
  - There are two elements comprising this building block: a learning triggering scheme and an intelligent information system.
  - The learning triggering scheme is in essence the contingent inventory of the learning circumstance.
    - From the perspective of learning circumstance, the contingent inventory constitutes the overall learning environment.
    - On the other hand, from the perspective of learning preliminary, it is a tool, which the decision maker uses in finding out an appropriate moment to start the learning process.
  - The intelligent information system enables the firm to direct the operations activities and manage the learning process. It is also part of the learning circumstance.

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# 4. THE LEARNING ALGORITHM

- **Learning algorithm** is a detailed learning process **(**Figure A2.28)
  - It starts after the firm knows that there indeed exist contingencies in the production process – the existential understanding, connected with the learning preliminary and also the learning circumstance at least indirectly.
  - It is triggered by the learning-triggering scheme in the learning preliminary, which in turn is based on the contingent inventory in the learning circumstance.

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# 4. THE LEARNING ALGORITHM

- **Learning routine**
  - Once the decision maker clarifies whether the significant deviation is caused by contingent or underlying reasons, or fluctuates randomly around a certain value, the learning routine can start.
  - It mainly consists of procedural steps, through which the formalized learning process proceeds. It can be done either on site or off site.
  - Using the chosen learning method, the company needs to conduct physical analyses of the operations problem to understand the basic structure of the issue, i.e., to develop a proper experiment.
  - Once the experiment is done, its outcomes need to be recorded using the intelligent information systems in place and the data to be further analyzed moving up the stages of knowledge.
  - The learning outcomes from this activity must be stored in a way that they can be readily available for next rounds of learning.
- **Iteration of the learning algorithm** – Once the learning routine is completed, one full cycle of learning is finished. The learning process itself must go on or iterate continuously.

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# 5. INTEGRATED LEARNING ALGORITHM

- The **integrated model** (Figure A2.31), a theoretical extension of the original one in Figure A2.28.
- The most important characteristics of the integrated model.
  - Separation of learning into continuous and current – the most important difference between the integrated and the original learning algorithm.
    - The integrated learning algorithm helps the firm engage in two different learning processes at the same time, one for the immediate problem solving and the other for the long-term improvement, i.e., it can solve the current managerial problems and enhance its capability at the same time.
    - Although the two learning processes are distinct, there are constant feedback and feed-forward between the current and continuous learning.
  - Designed for TQM – it is designed for TQM by focusing on both quality and capability improvement simultaneously.

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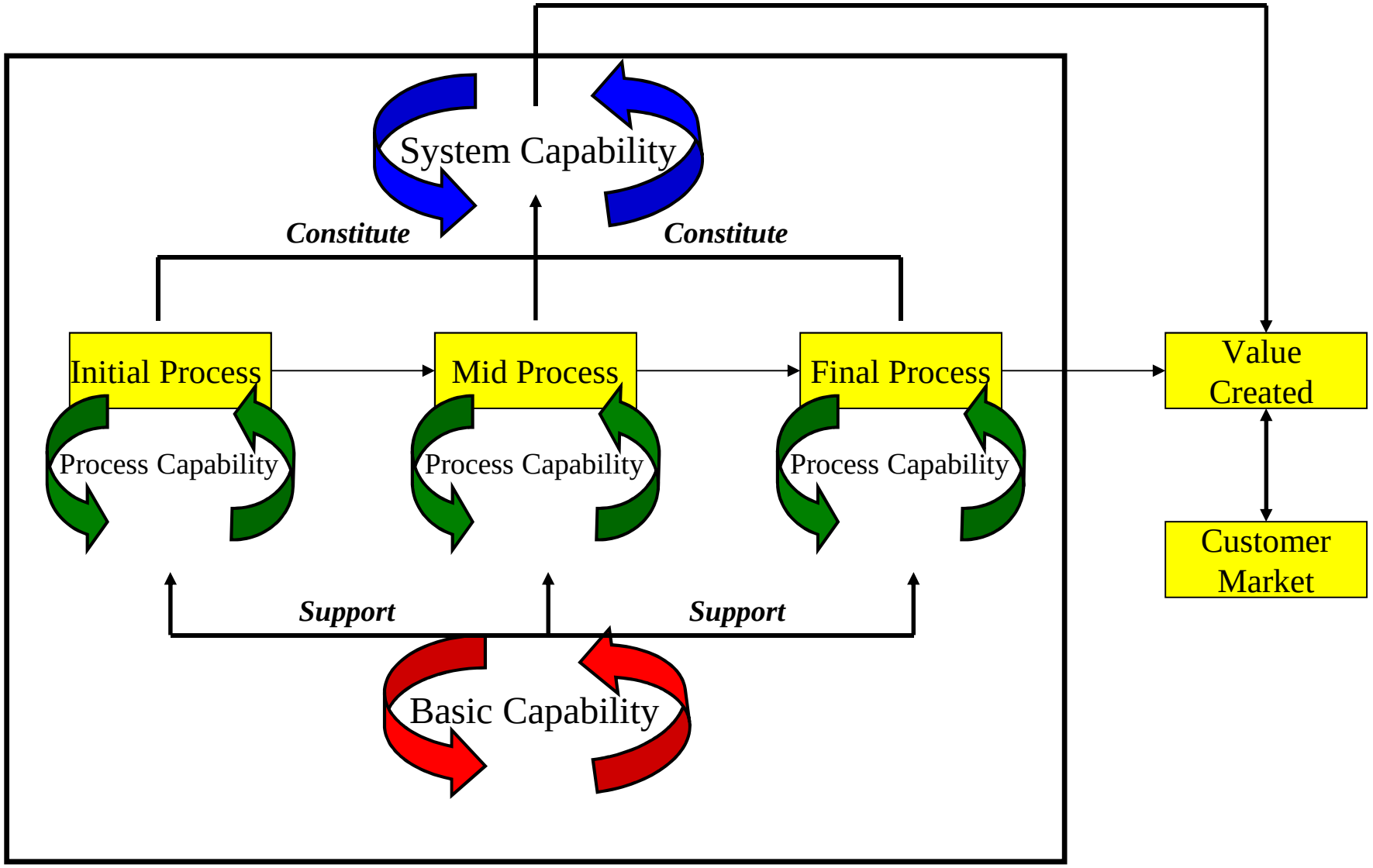
# **Figure A2.22** Process and capability



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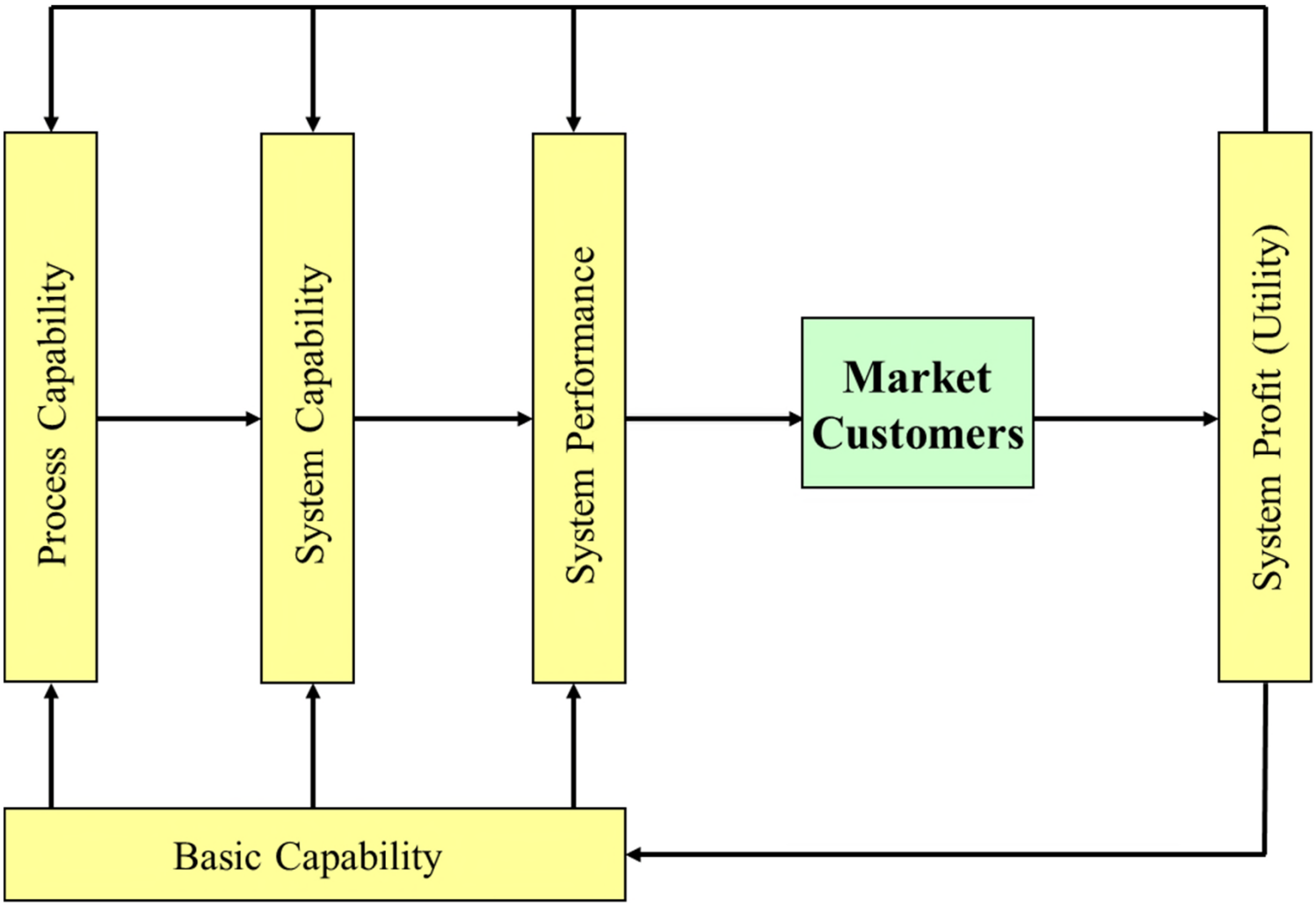
# **Figure A2.23** Basic capability supporting other capabilities



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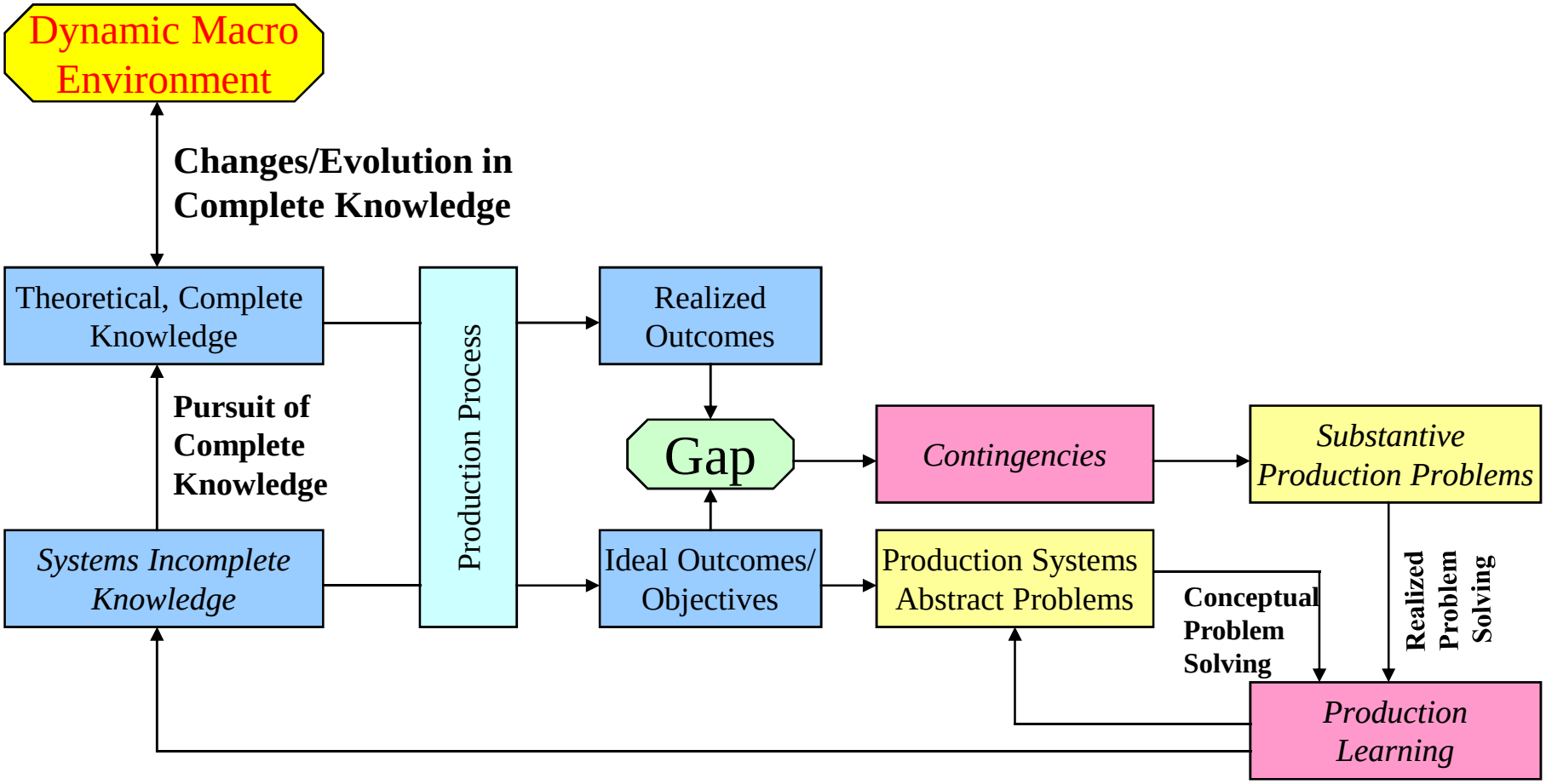
# **Figure A2.24** The dynamic view of learning in operations



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# **Figure A2.25** Knowledge stages*

- **Stages of Knowledge**
  1. **Capable of recognizing good output without any sense of how**
  2. **Begin to recognize variables (key dimensions)**
  3. **Perceive the relevance of variables**
  4. **Ability to measure the variables**
  5. **Local control over them (can control primary variables locally)**
  6. **How the local changes in a variable affect output**
  7. **Can control secondary variables**
  8. **Complete knowledge**

* Jaikumar, R. and R. E. Bohn (1992). A dynamic approach to operations management: An alternative to static optimization. International Journal of Production Economics, 27 (3), 265-282.

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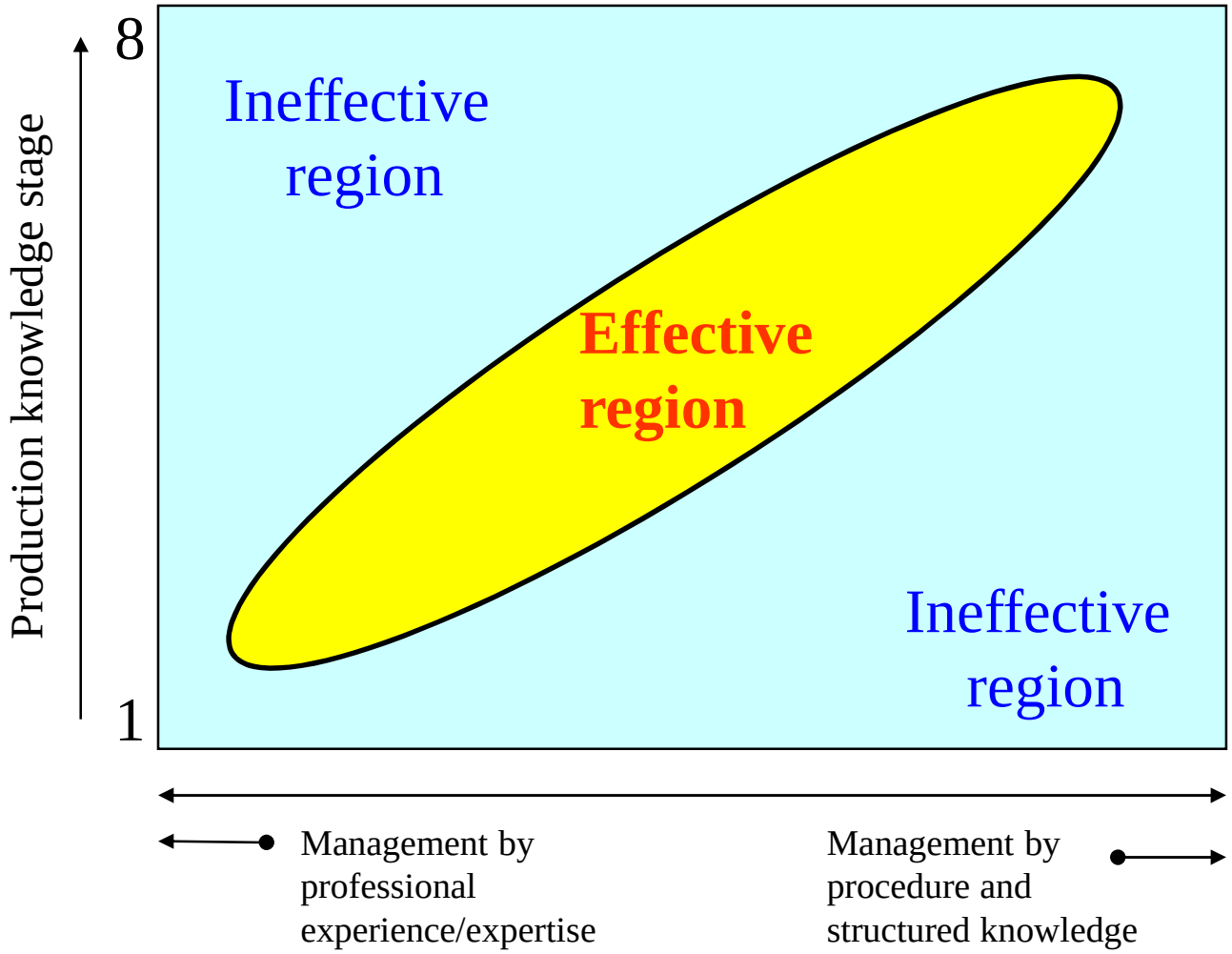
# **Figure A2.26** Knowledge development and management approaches*




* Jaikumar, R. and R. E. Bohn (1992). A dynamic approach to operations management: An alternative to static optimization. International Journal of Production Economics, 27 (3), 265-282.

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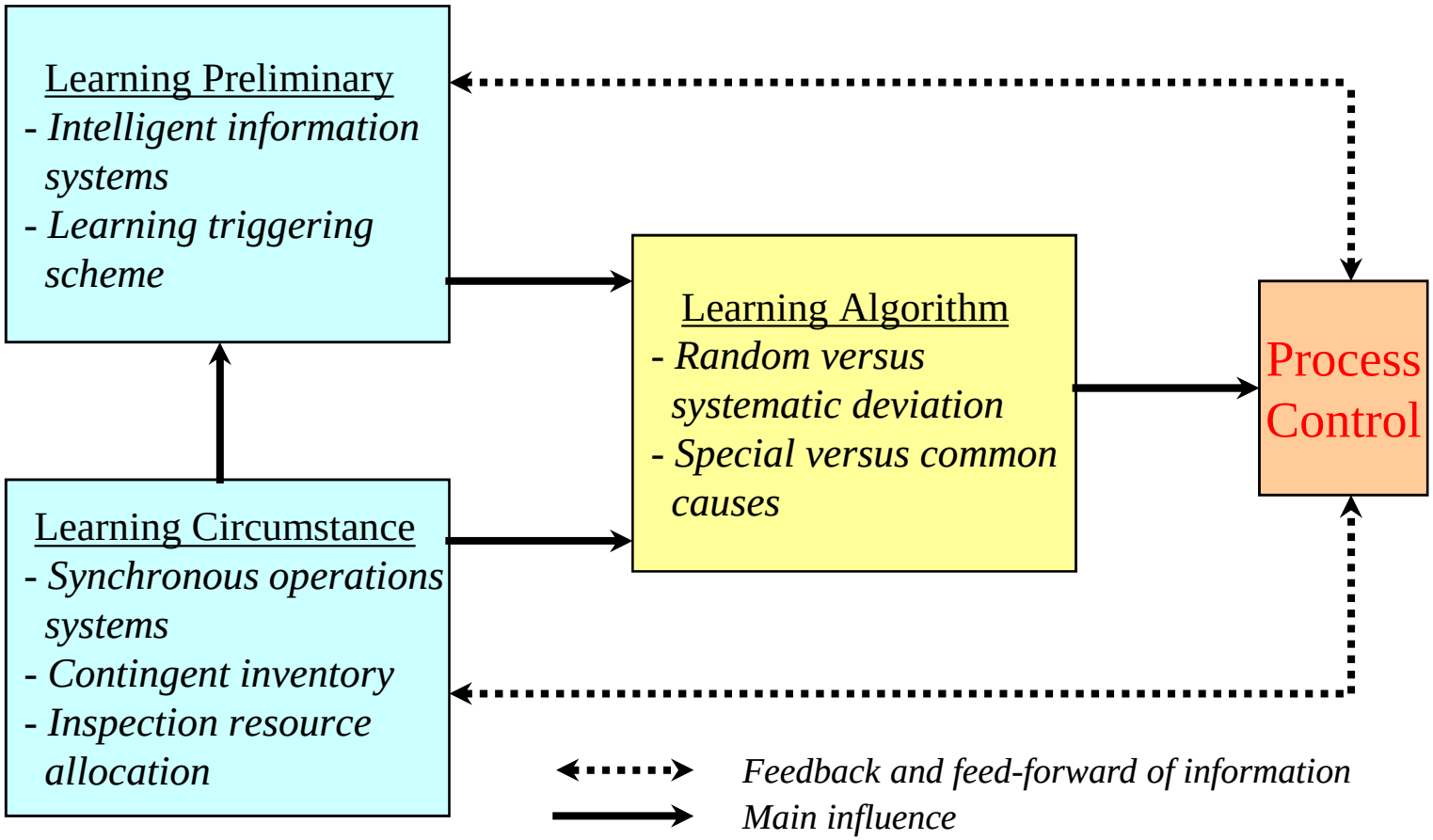
# **Figure A2.27** A learning model



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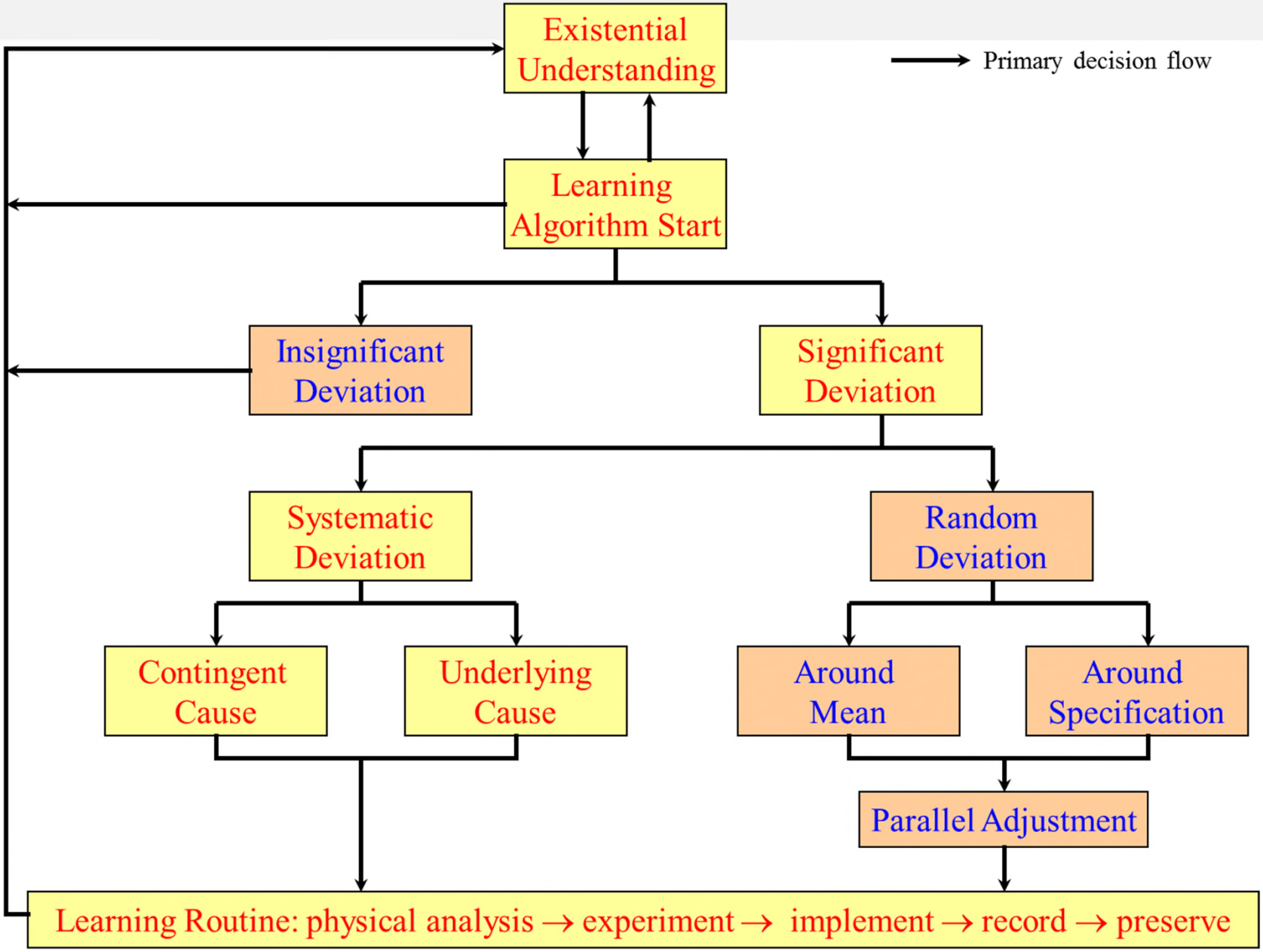
# **Figure A2.28** A learning algorithm



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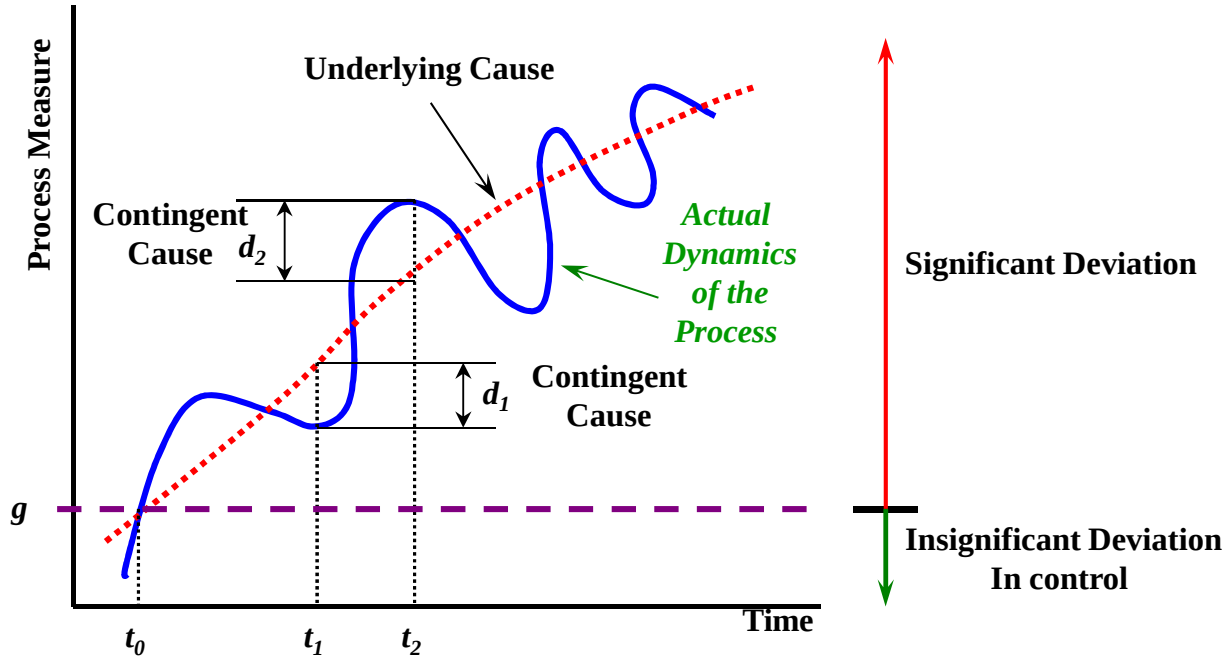
# **Figure A2.29** Contingent and underlying causes



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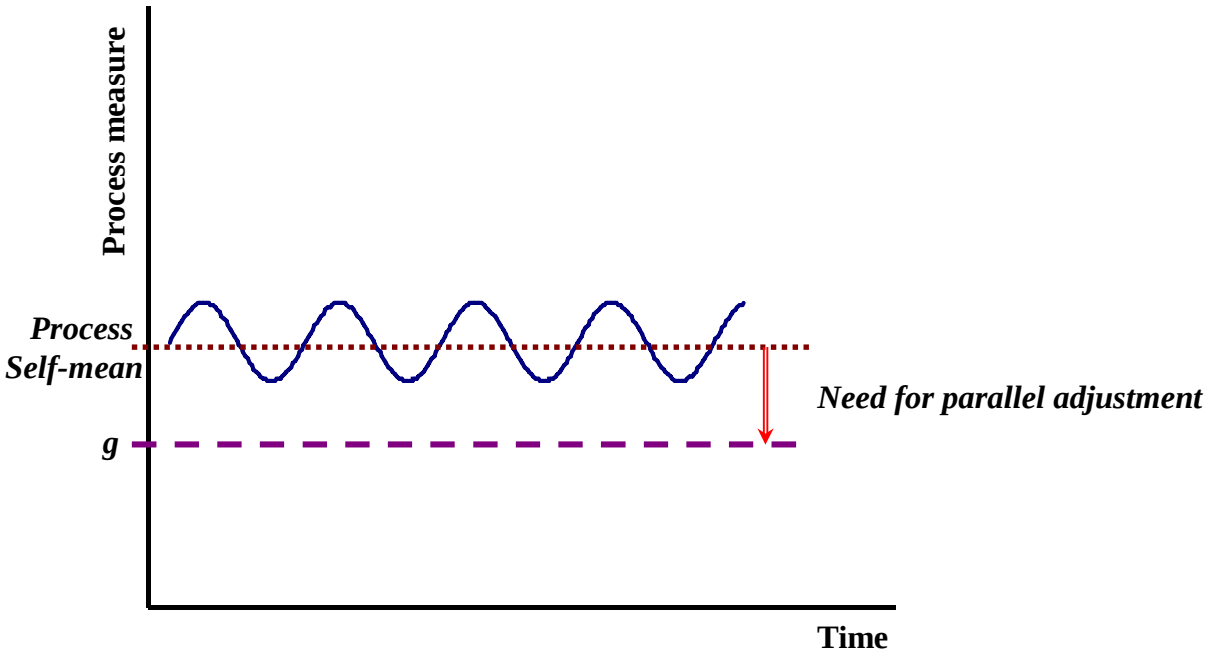
# **Figure A2.30** Random deviation



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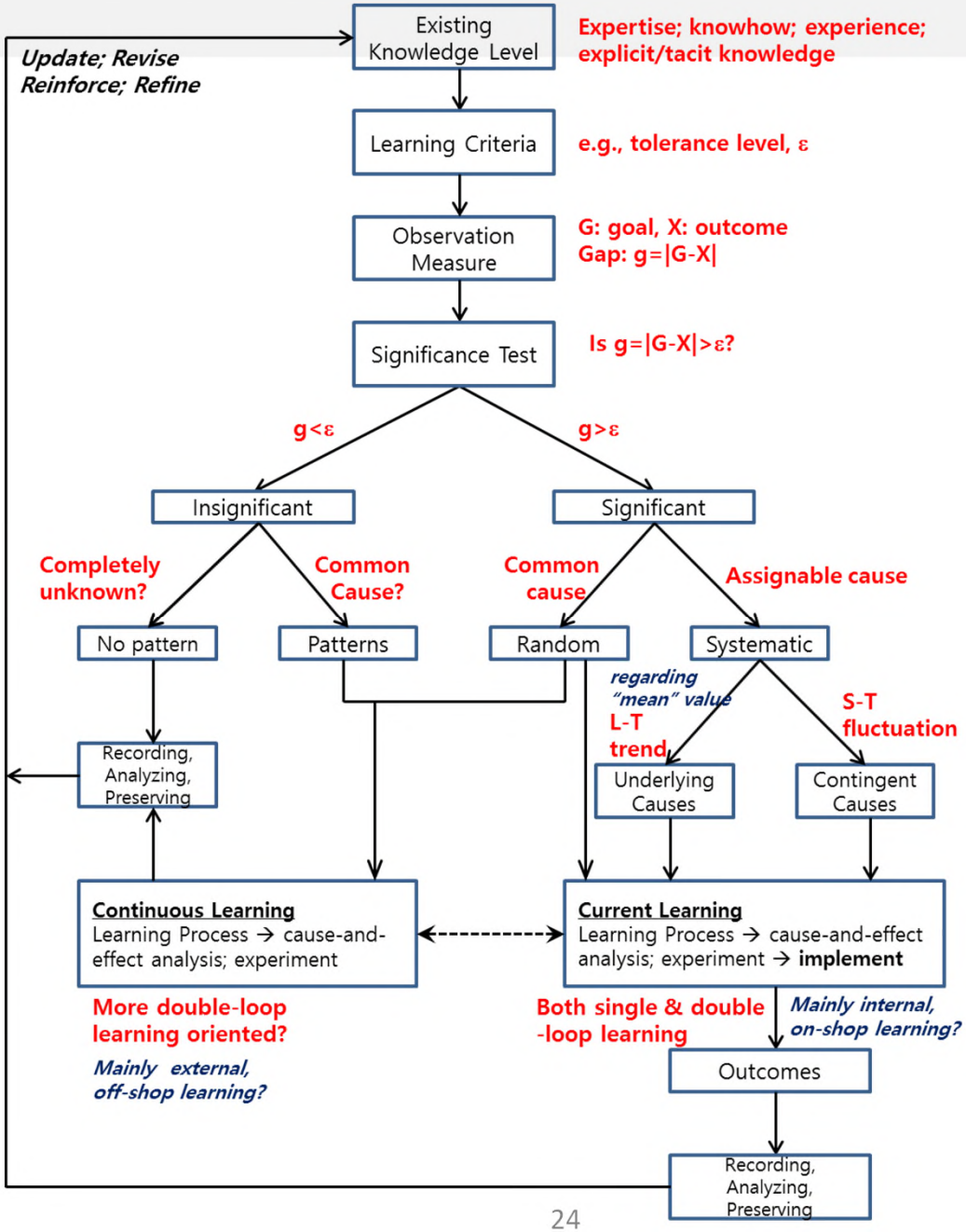
# **Figure A2.31** Integrated learning algorithm



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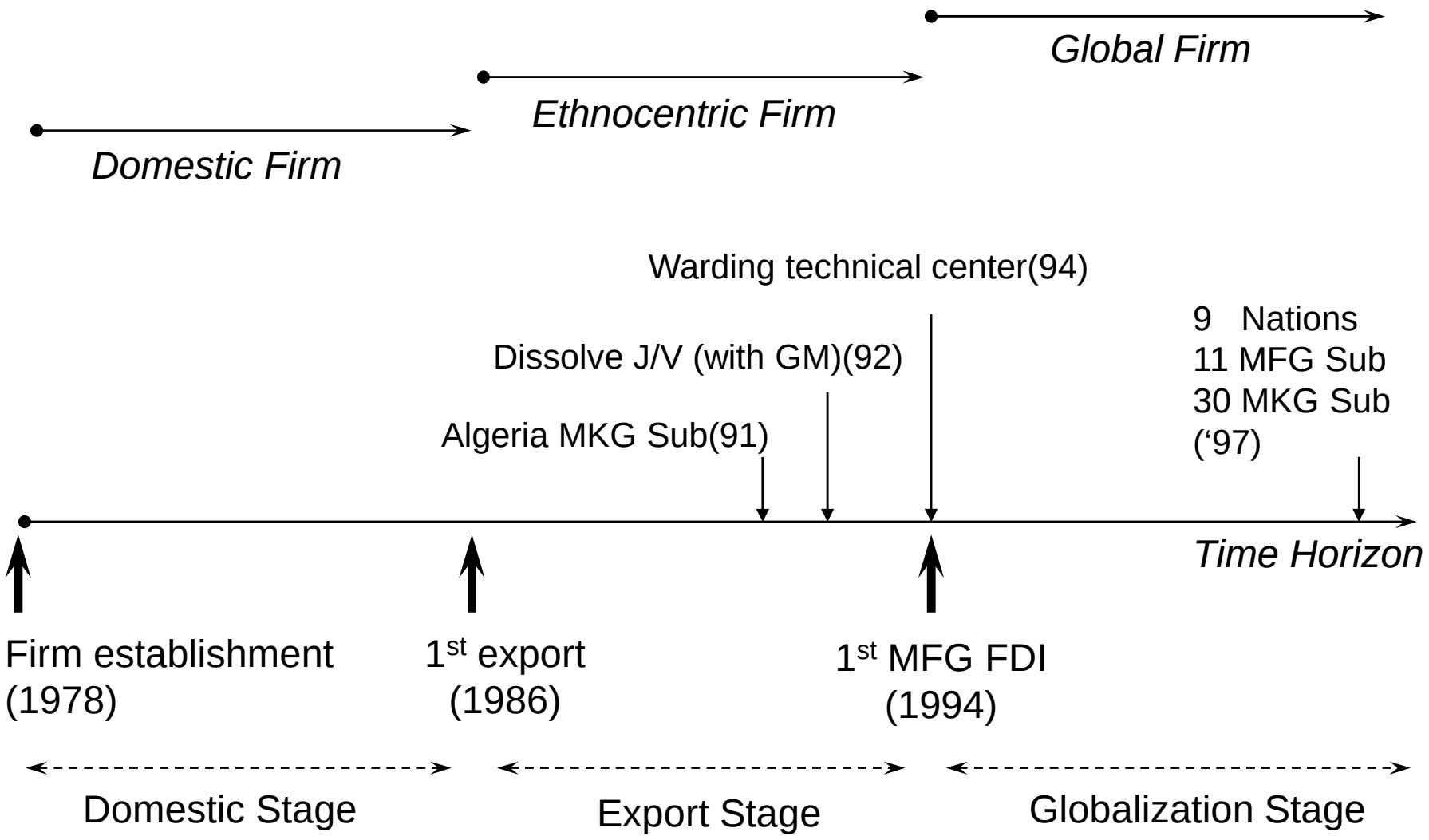
# **Figure A2.32** Daewoo's globalization



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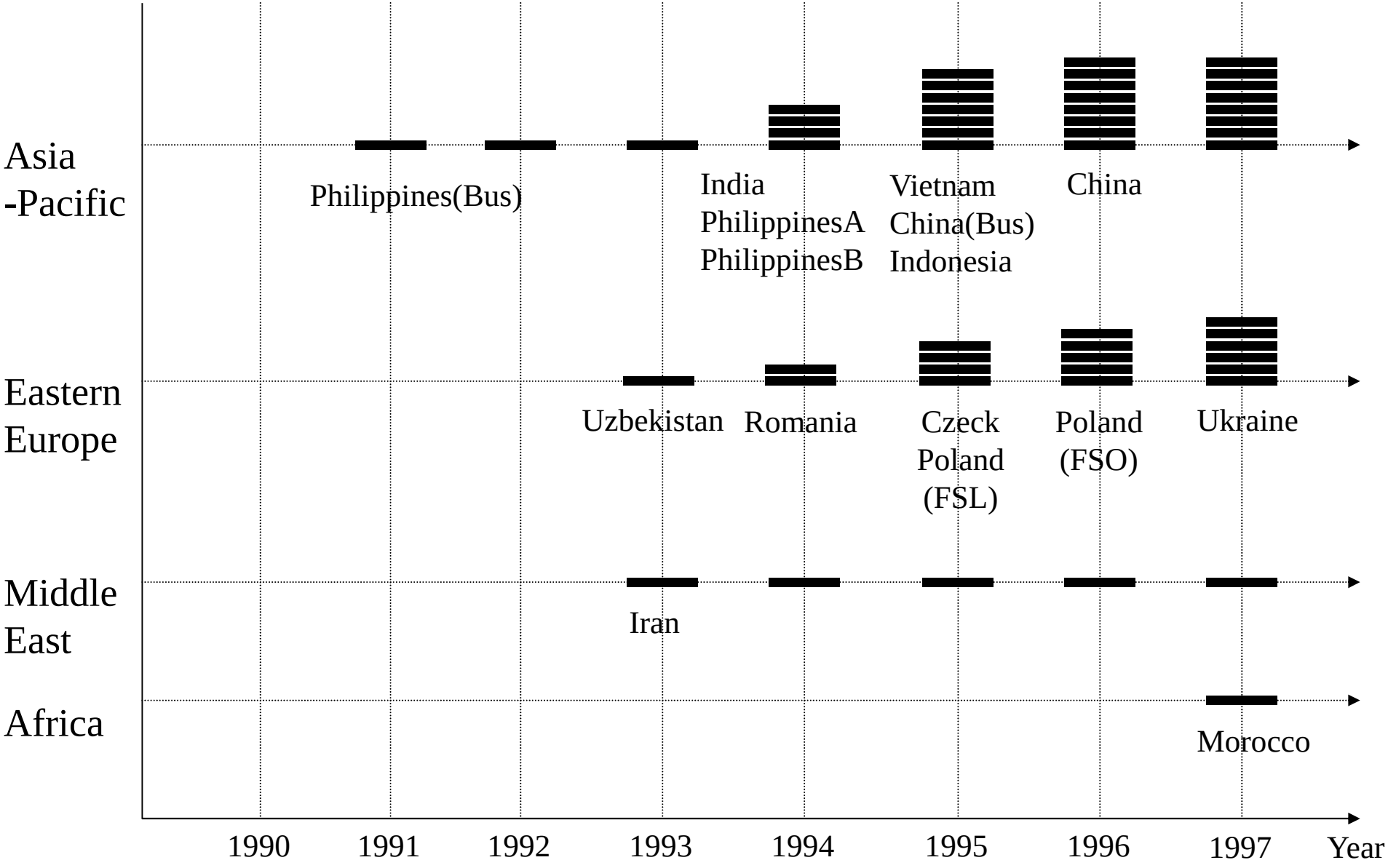
# **Figure A2.33a** Daewoo's globalization by function

(a) Manufacturing



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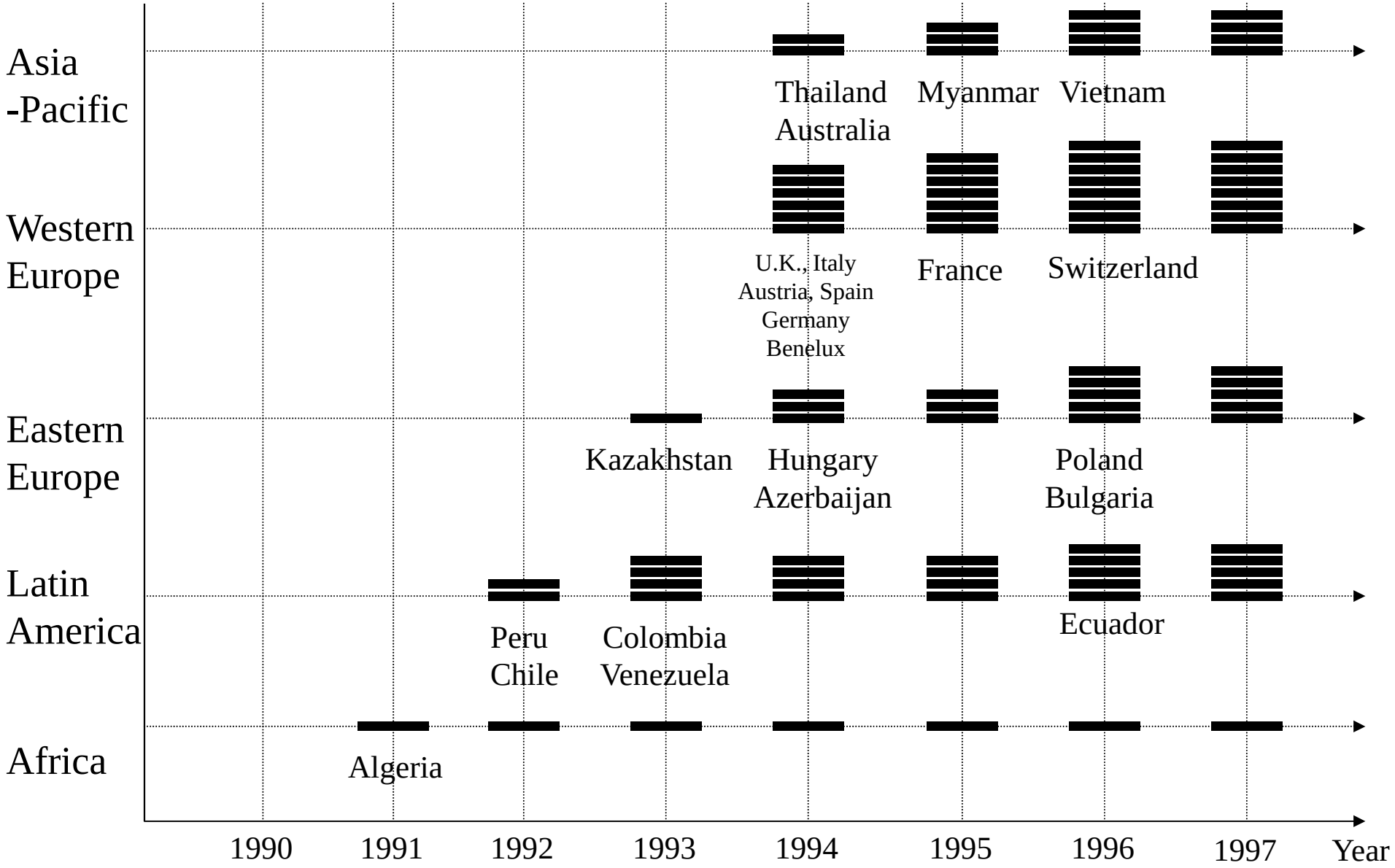
# **Figure A2.33b** Daewoo's globalization by function

(b) Marketing



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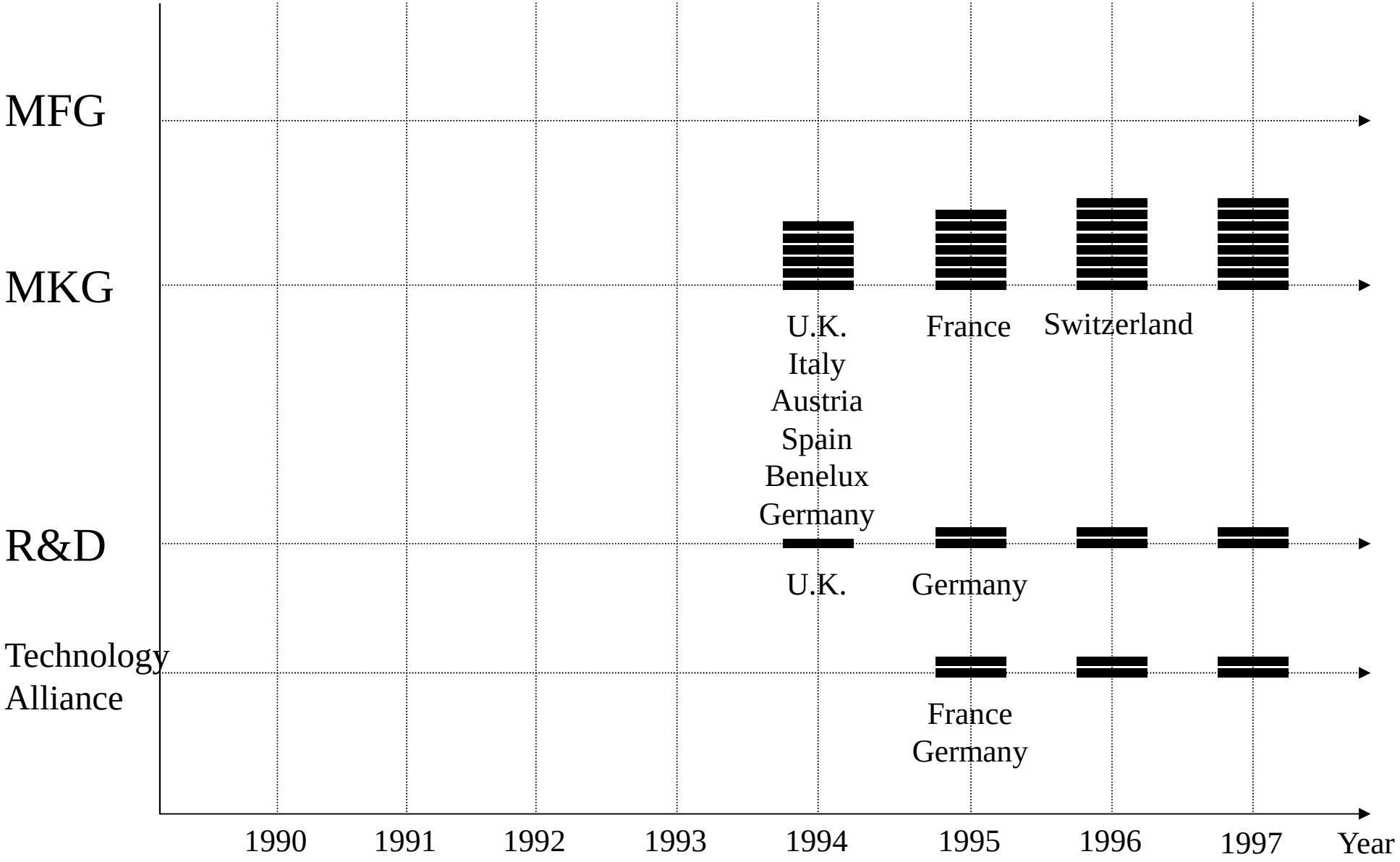
# **Figure A2.34a** Daewoo's globalization by region

(a) Western Europe



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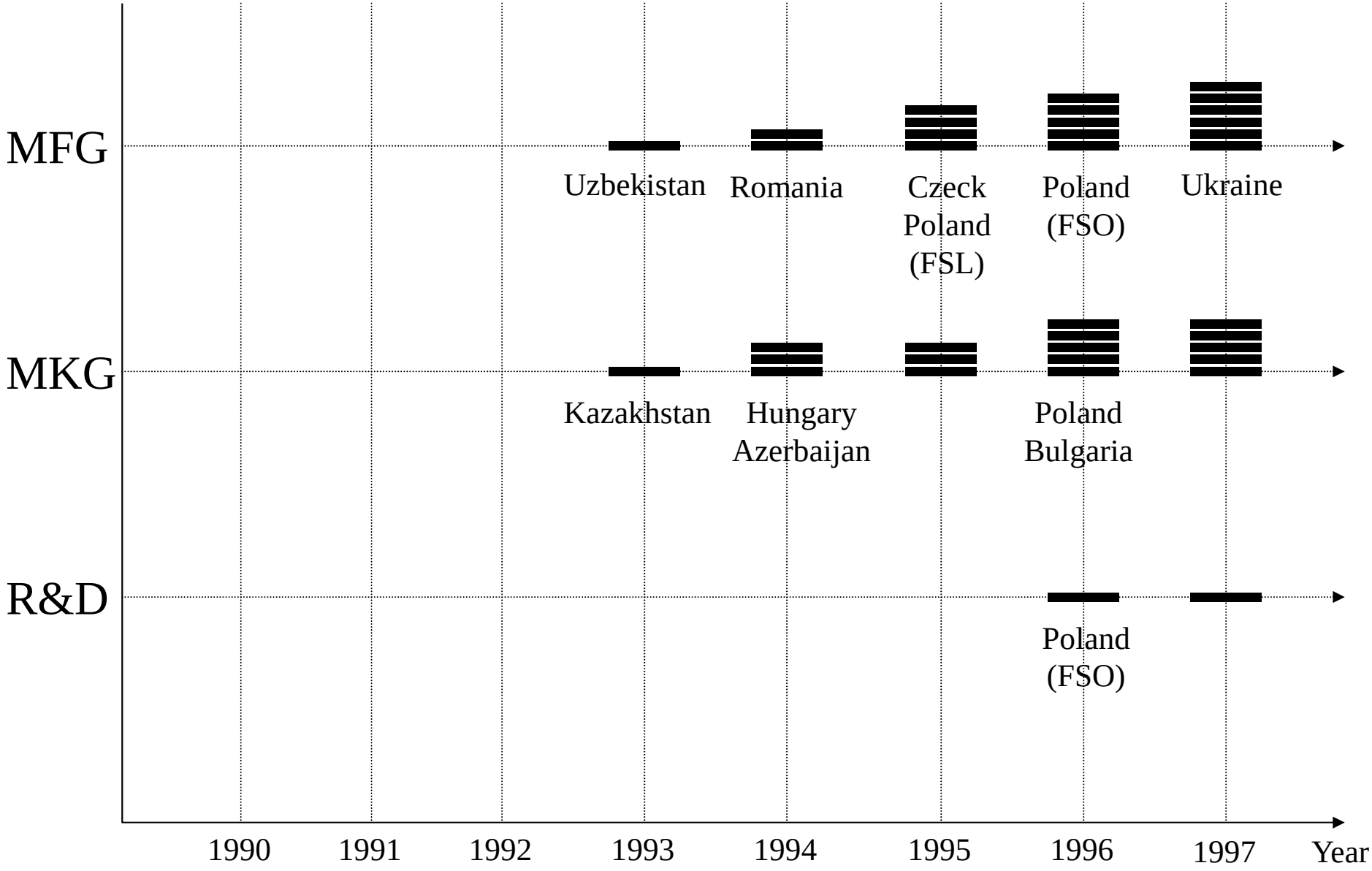
# **Figure A2.34b** Daewoo's globalization by region

(b) Eastern Europe



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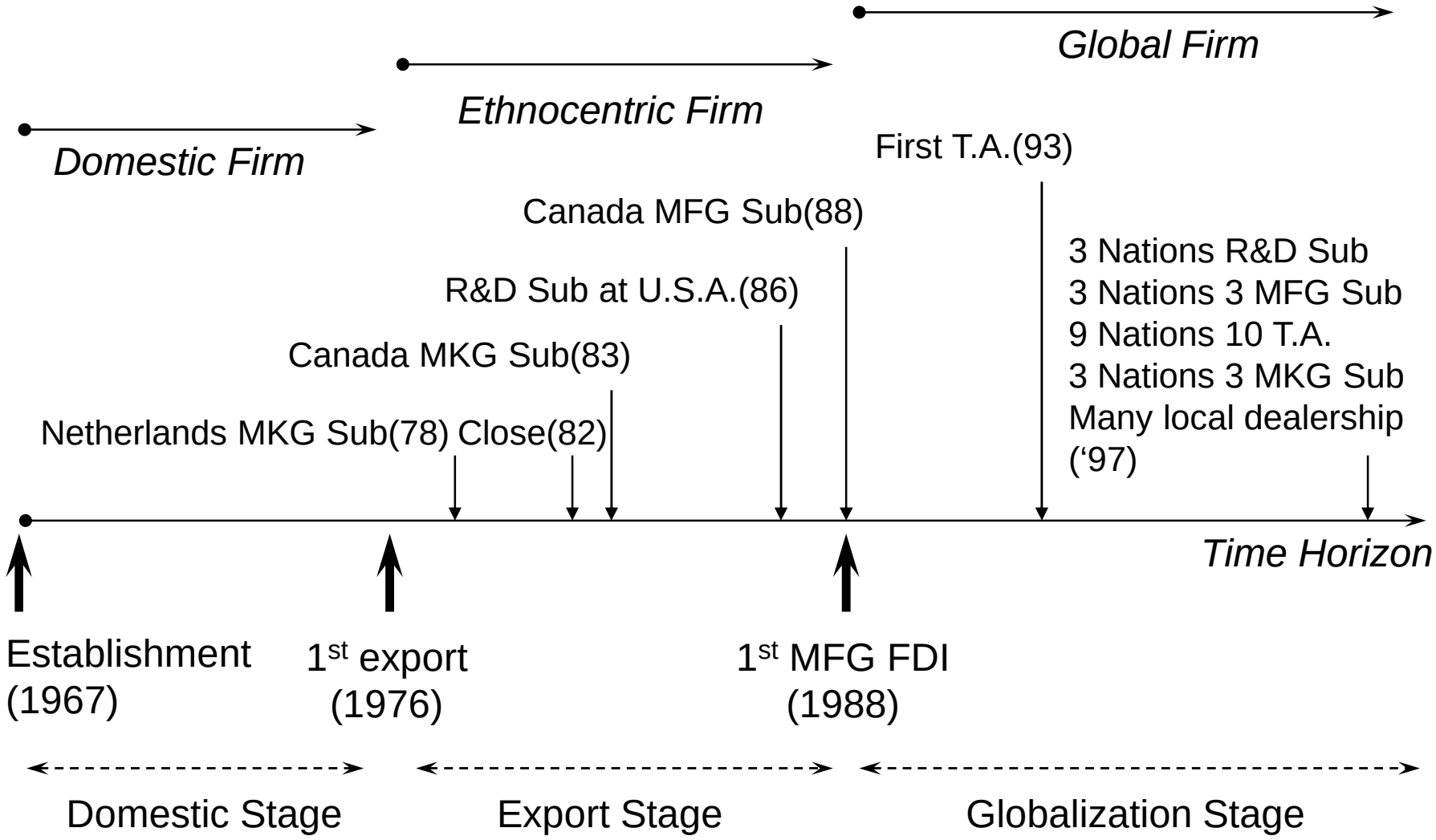
# **Figure A2.35** Hyundai's globalization



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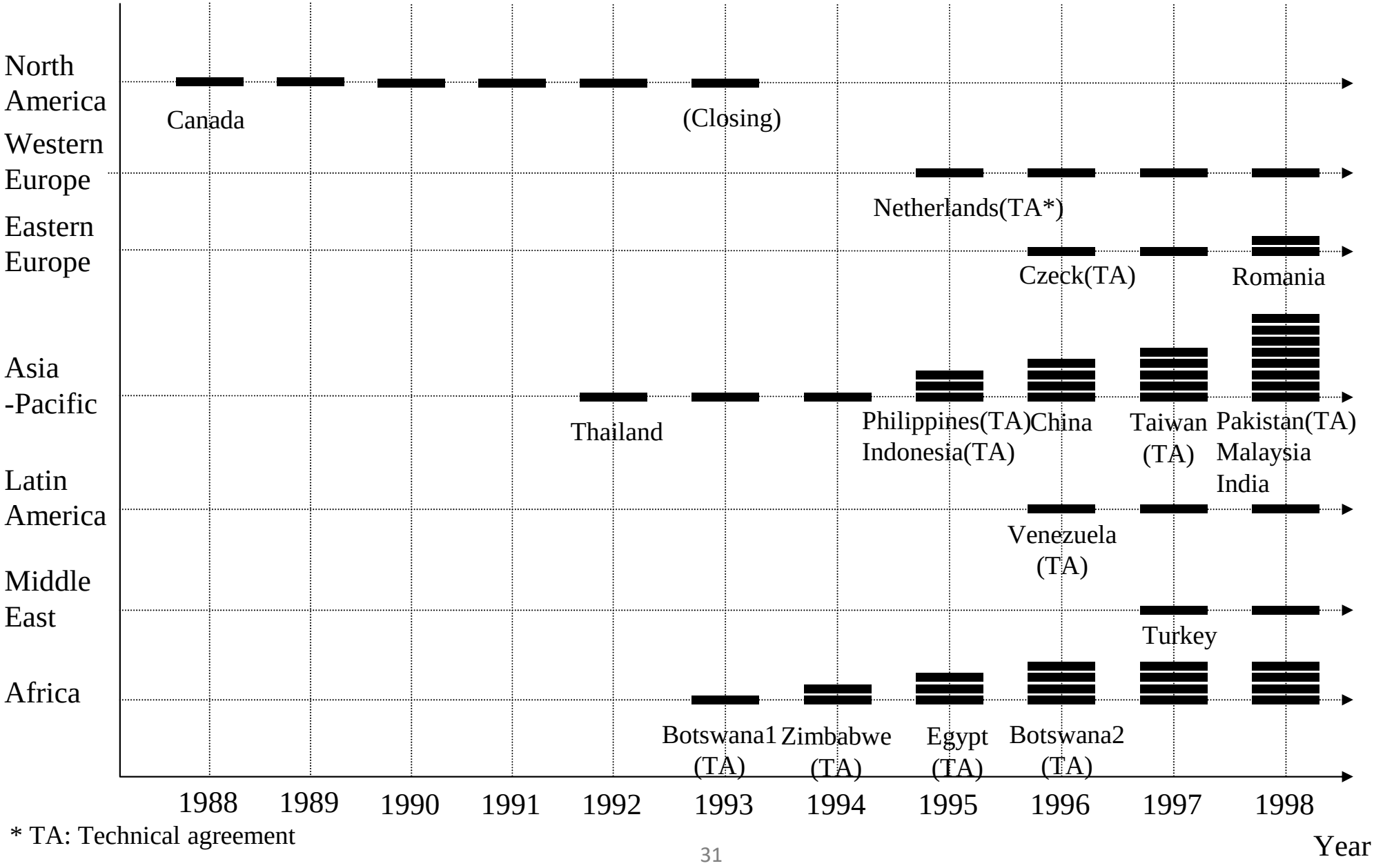
# **Figure A2.36a** Hyundai's globalization by function

(a) Manufacturing




* TA: Technical agreement

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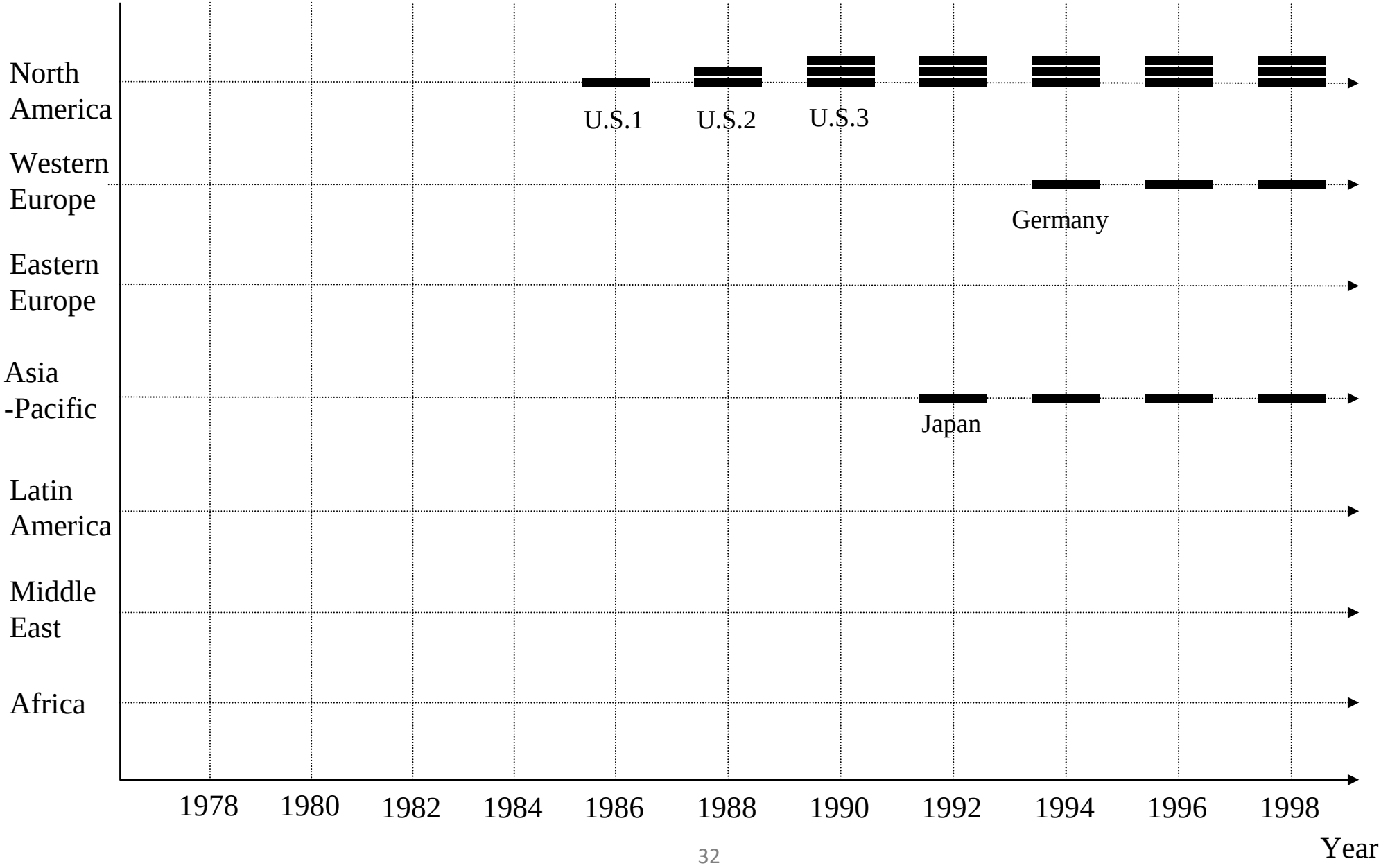
# **Figure A2.36b** Hyundai's globalization by function

(b) R&D



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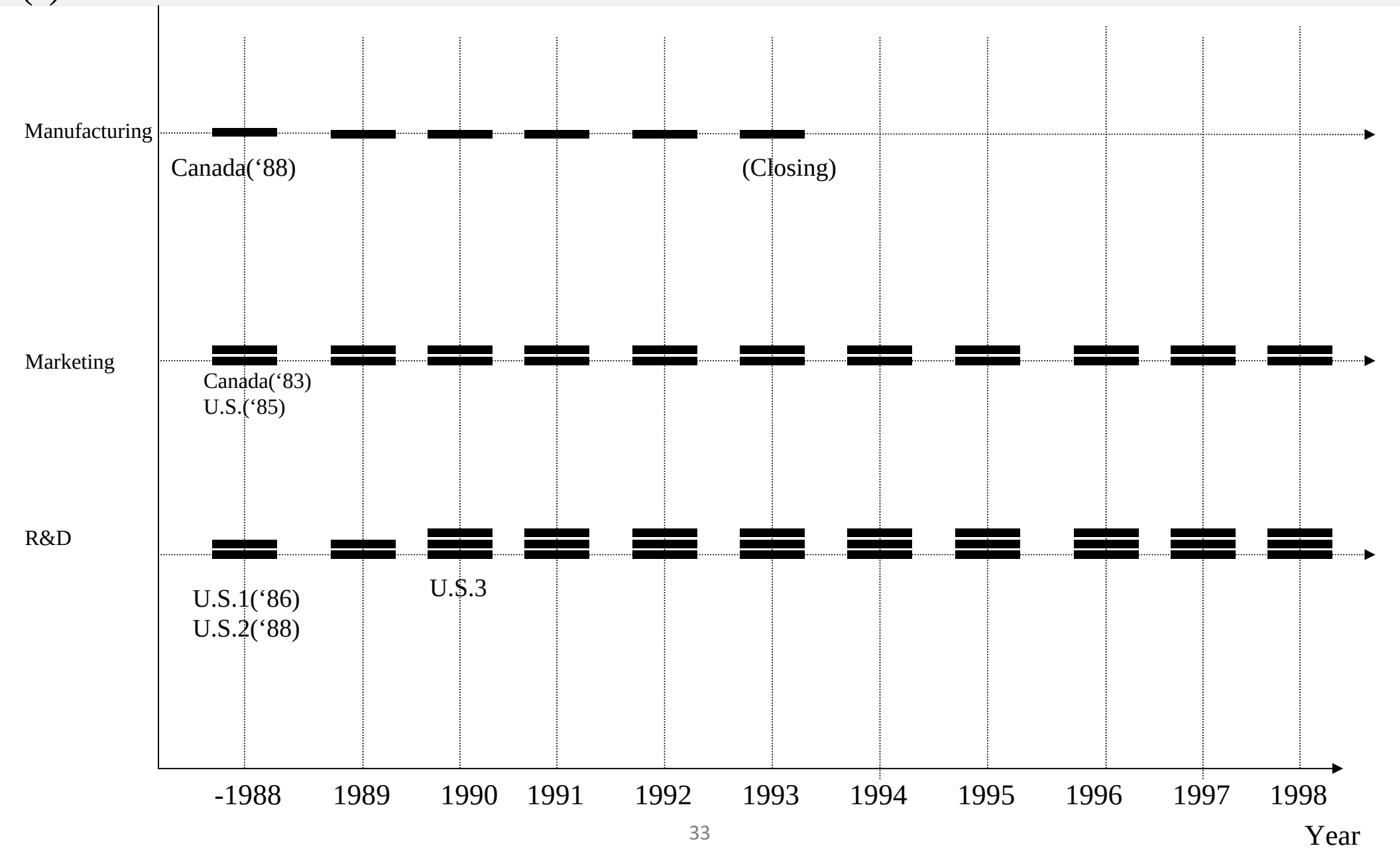
# **Figure A2.37** Hyundai's globalization by region

(a) North America



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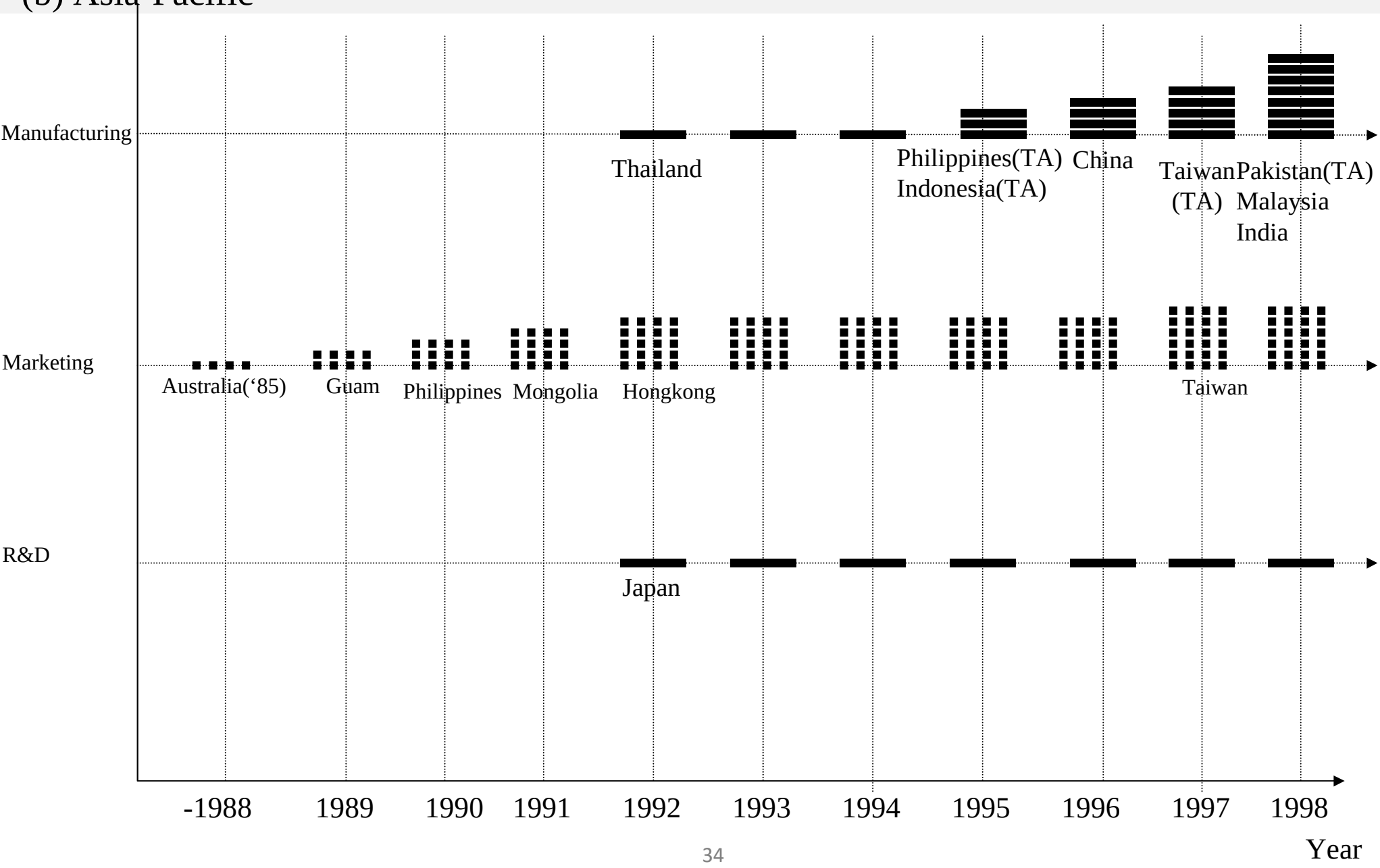
# **Figure A2.37** Hyundai's globalization by region

(b) Asia-Pacific



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# **Table A2.2** Comparison of chaebols – Daewoo and Hyundai

| Attributes | *Daewoo* Motor Co. | *Hyundai* Motor Co. |
|---|---|---|
| Market share in the Korean car market (in 1993) | About 20% | About 50% |
| Time (year) to enter the automobile industry | 1978 | 1967 |
| Total asset – business group as a whole (as of 1996) | US$39.1 billion | US$54.6 billion |
| Business portfolio (sales ratio) – business group as a whole ( as of 1997) | – Automobile: 17%<br>– Construction: 10%<br>– Electronics: 16%<br>– Heavy Industry: 10%<br>– Petrochemical: -<br>– **Textile/Trade: 42%**<br>– Logistics/Shipping: -<br>– Financial/Services: 5% | – **Automobile: 33%**<br>– Construction: 14%<br>– Electronics: 6%<br>– Heavy Machinery: 15%<br>– Petrochemical: 9%<br>– Textile/Trade: 9%<br>– Logistics/Shipping: 5%<br>– Financial/Services: 9% |

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# **Figure A2.38** Manufacturing capacity expansion – Daewoo and Hyundai

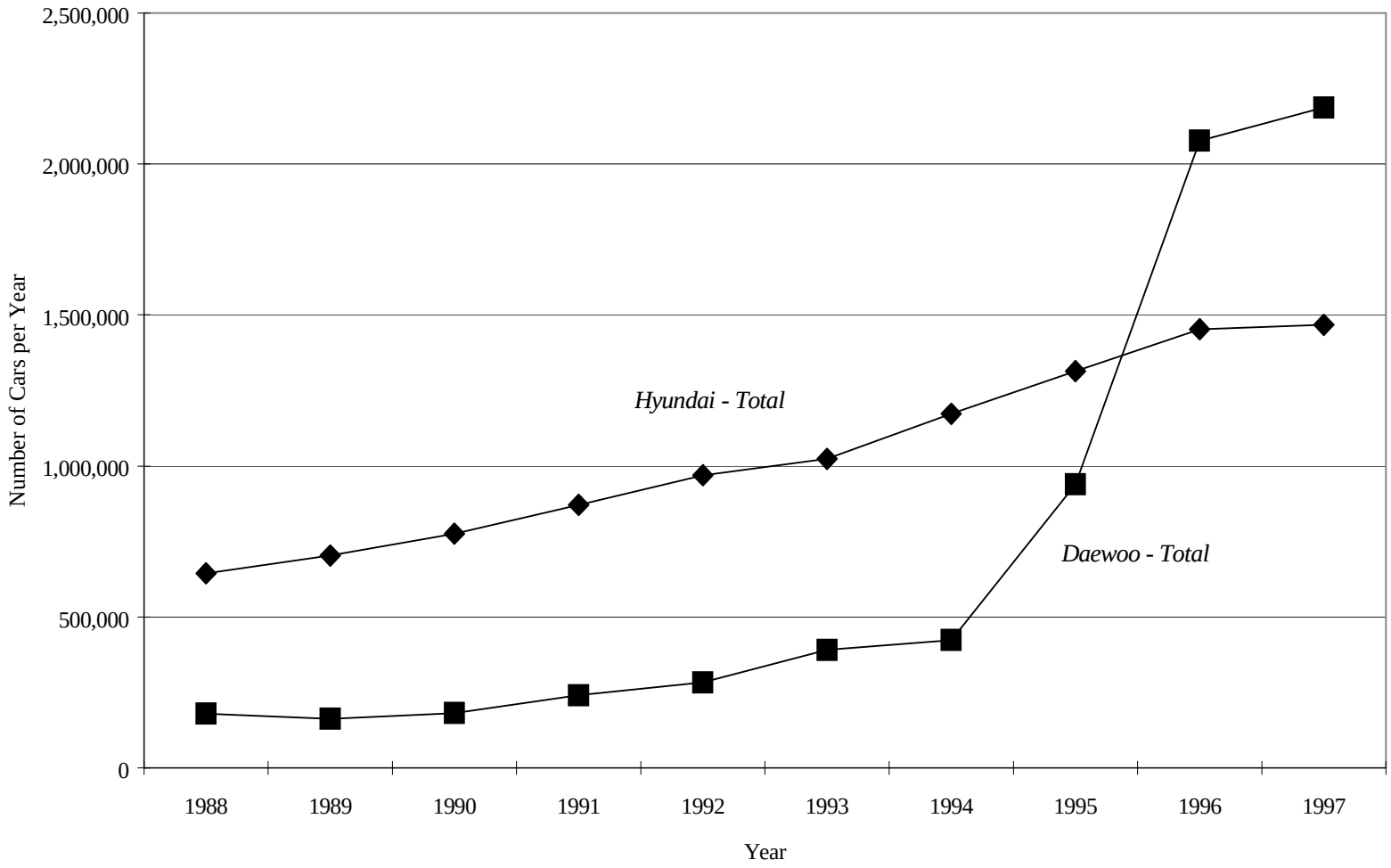

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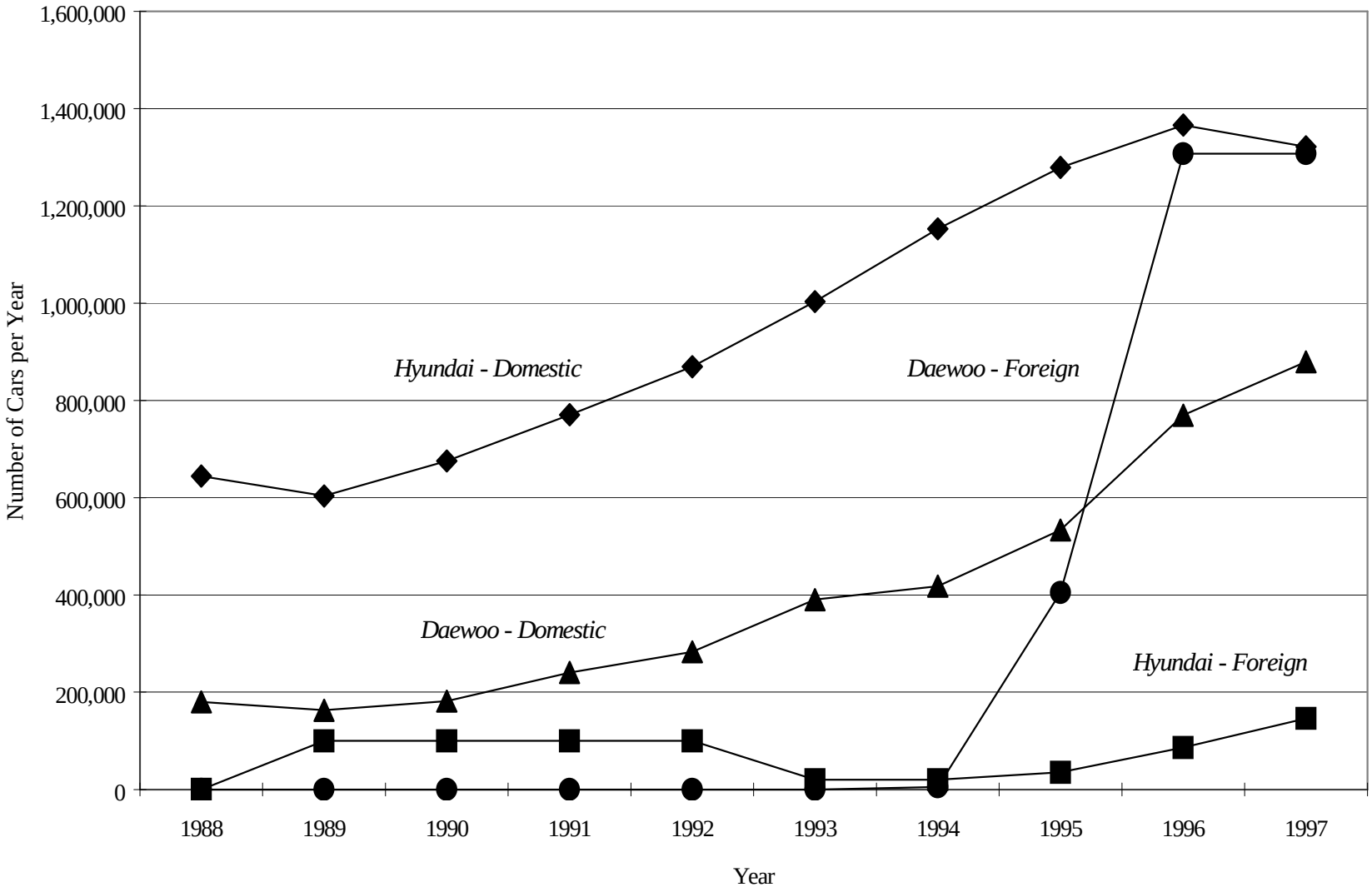
**Figure A2.39** Domestic versus foreign manufacturing capacity expansion



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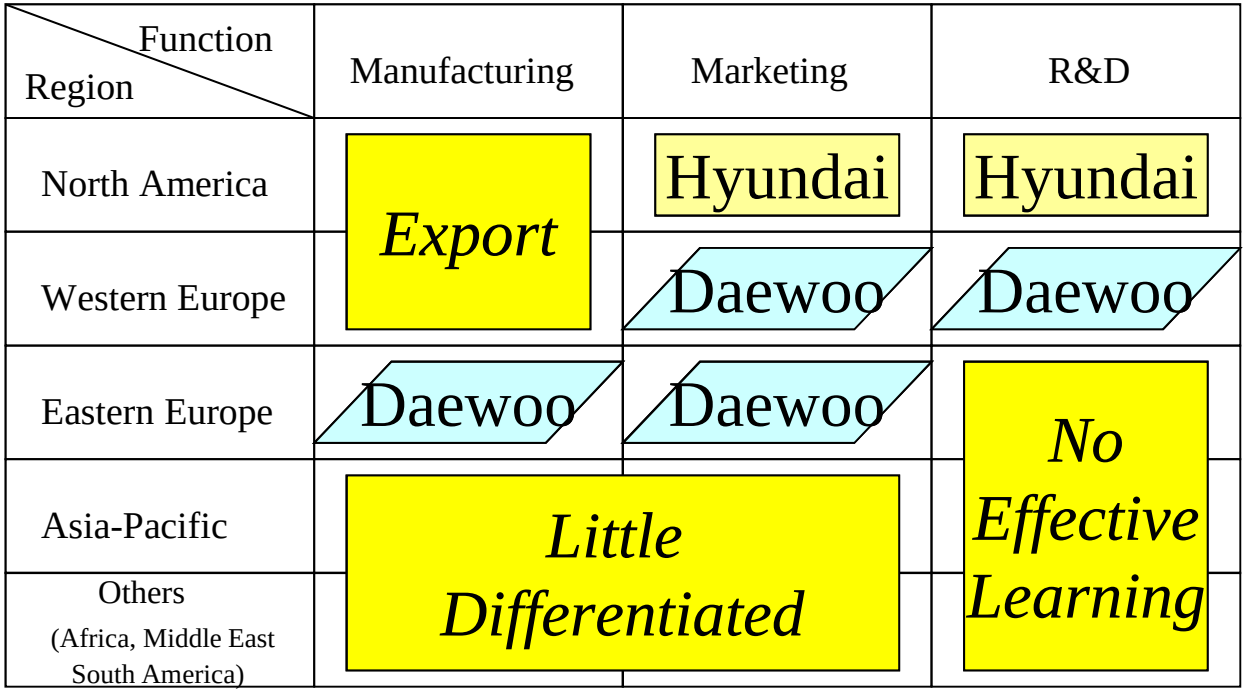
# **Figure A2.40** Global market-function strategy mix – Daewoo and Hyundai



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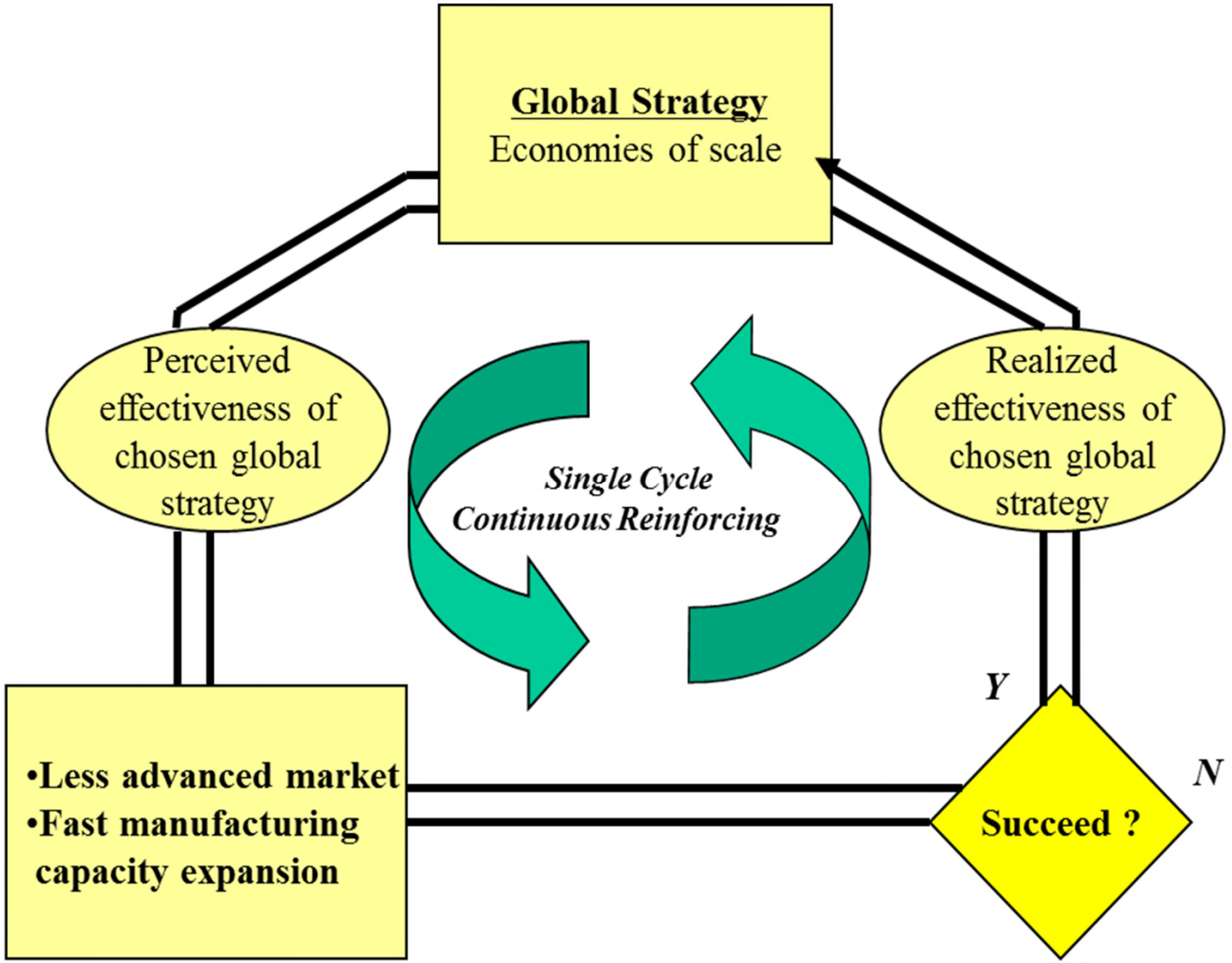
# **Figure A2.41** Global learning propensity dynamics – Daewoo



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# **Figure A2.42** Global learning propensity dynamics – Hyundai