

Global R&D activities of Japanese MNCs in the US: A triangulation approach.

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Presenter : Hsin-Ling Shen

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1.1 The authors



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- Ph.D. degree in business administration from Hokkaido University (北海道大學)
- Research Associate Professor at Hokkaido University



Edward Roberts

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- Founder and Chair, Martin Trust Center for MIT Entrepreneurship

- **In Tradition:** R&D activities in multi-national corporations (MNCs) were **centralized** and concentrated in a home country.
 - **Nowadays:** MNCs have been rapidly globalizing their R&D activities, especially for the last two decades.
 - US companies' investment in overseas R&D has increased three times faster than company funded domestic R&D over the last 10 years (10.1% vs. 3.4%)
 - The largest US (and European) R&D spenders are even more concentrated in foreign locations (>33%)
 - The number of overseas R&D subsidiaries by Japanese MNCs has been increasing approximately **10%** annually for the past decade.
- R&D activities must be **decentralized**, and how to efficiently organize global R&D activities?

1.2 The Questions

- (1) Why **knowledge flows** are important in managing global R&D subsidiaries?
- (2) What factors determine **knowledge flows** among R&D subsidiaries, headquarters (HQ), and other subsidiaries?
- (3) What factors determine **knowledge accumulations** of R&D subsidiaries?
- (4) What factors determine **performance** of R&D subsidiaries?
- (5) How should R&D subsidiaries **manage** knowledge flows for higher performance?

2.1 The knowledge-based view (KBV)

- **Background** : External markets, remain relatively ineffective mechanisms for knowledge sharing and transfer because:
 - (1) Specialized knowledge of firms tends to be tacit and thereby difficult to transfer.
 - (2) Market-based transfers of knowledge are often associated with negative externalities such as involuntary expropriation and the risk of creating a new competitor.
- **KBV of MNCs** : A competitive advantage is based on how efficiently MNCs share knowledge across HQs and subsidiaries
- **Nine Related researches** : see the following page

2.1 The knowledge-based view (KBV)

	Unit of analysis	Country origin of MNCs	Knowledge flow measurement	Performance measurement	Major findings
Nobel and Birkinshaw (1998)	110 R&D subs in 15 MNCs	Sweden	Actual frequency of communications in both face-to-face and other methods	N/A	Communication methods vary depending on types of R&D subs.
Gupta and Govindarajan (2000)	374 general subs in 75 MNCs	US, Europe, Japan	6 Likert-type questions	N/A	Knowledge flows are associated with sub's knowledge stock, absorptive capacity, motivational disposition and the richness of transmission channels.
Subramaniam and Venkatraman (2001)	90 new product development projects in 52 MNCs	US, Europe, Japan, and Korea	3 Likert-type questions	N/A	Global product development capabilities of MNCs depend upon their ability to transfer and deploy tacit knowledge concerning overseas markets.
Hakanson and Nobel (2001)	120 R&D subs in 18 MNCs	Sweden	Actual technology transfer from subs to HQs (a dummy)	N/A	The higher integration, the more tech. flow from subs to HQs.
Birkinshaw et al. (2002)	110 R&D subs in 15 MNCs	Sweden	Frequency of technological know-how transfer	N/A	Two dimensions of knowledge—observability and system embeddedness—influence knowledge flows.
Almeida et al. (2002)	21 MNCs in the semiconductor industry	US, Japan, Taiwan, Korea, Singapore, Italy, France, Germany, Netherlands, UK	Patent citations	N/A	The superiority of MNCs stems from their ability to use multiple mechanisms of knowledge transfer flexibly and simultaneously.
Cummings and Teng (2003)	69 HQs in US	US	22 Likert-type questions on knowledge flow success	The same as knowledge flow measures	Knowledge transfer success was associated with the extent of interactions and articulation processes.
Foss and Pedersen (2003)	2,107 general subs in Austria, Denmark, Finland, Germany, Norway, Sweden, and UK	Not Specified	6 Likert-type questions on knowledge flow	N/A	MNC management can influence knowledge flows through choices regarding control, motivation, and context.
Minbaeva et al. (2003)	169 general subs in US, Russia, China	Not specified	2 Likert-type questions	N/A	Interaction of ability and motivation facilitates knowledge flows.

Note: Subs, subsidiaries; HQs, headquarters; general sub, subsidiaries for marketing, manufacturing, and/or R&D.

Most of these studies investigated general subsidiaries such as manufacturing or marketing subsidiaries within MNCs. Only two studies on R&D subsidiaries within MNCs.

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No empirical study on knowledge flows of Japanese MNCs and their R&D subsidiaries specifically focuses (Some survey-based studies on recent global R&D activities in Japanese MNCs mainly have examined “external factors,” such as when, how, and why Japanese MNCs globalized their R&D activities.

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Most of these studies measured either knowledge in-flows from HQs to a subsidiaries or knowledge out-flows from subsidiaries to HQs. most of these studies measured vertical knowledge flows between HQs and subsidiaries. No study has measured **both in-flows and outflows vertically and horizontally**. We argue that both knowledge in-flows and out-flows should be measured vertically and horizontally in order to test the validity of the KBV of MNCs.

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- Most of these studies did not seriously consider differences of knowledge flows in **various industrial settings** (we argue that knowledge flows of MNCs in the electronics industry are different from those in the pharmaceutical industry, where intellectual property rights and government regulations tend to significantly affect their R&D strategies)
- Most of these empirical studies either used knowledge flows as performance indicators or assumed that a high level of knowledge flows lead to high performance. (We argue that **knowledge flows are activities, which involve costs.** Thus, we argue that there might be an optimal level of knowledge flows.)

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2.2 Knowledge creation process

- The KBV of MNCs seems to assume :



- **We disagree the assume**, because :
 - (1) The knowledge is a stock, but knowledge flows are cost involving activities. knowledge **must be utilized** for higher performance. we also argue that stocked (or accumulated) knowledge leads to informed, efficient and timely decision-making, thus achieving high performance.
 - (2) The assume disregard **qualitative** aspects of knowledge flows and knowledge creation processes. We argue that both market- and technology-related knowledge flows are critically important for such new meaning creations.
 - Nonaka and Toyama (2002) argue that “**Ba**”—roughly means “**place or community**” in English—offers such a dynamic context which links visions, practices, and dialogues. (very similar to “**communities-of-practices**,” proposed by Lave and Wenger (1991).)
- **We argue that** : “new meanings” will be created by uniquely associating knowledge flows with accumulated knowledge stock of MNCs or their sub-sidiaries, and that both **market- and technology-related** knowledge flows and accumulations are needed for the new meanings to have values.

2.3 Type of knowledge flows

Type	Content
Sub-HQ	“ Vertical knowledge flows” between a subsidiary and its parent company. It can substantially promote international transfer of competencies, by calling such flows “reverse transfers.”
Sub-Sub	“ Horizontal or lateral knowledge flows” between a subsidiary and other subsidiaries.
Sub-Local	The knowledge flows between local environments (i.e., local universities, local governments, customers, suppliers, or competitors) This is the listening post role of the subsidiary where the receiver’s competence (i.e., assessing, filtering, and choosing knowledge flows)

2.4 Factors affecting knowledge flows

Literature

Category	Content
Home-base-augmenting	<p>“Center of excellence,” by aiming at the basic end of the R&D spectrum, thus making the subsidiary a center of technical knowledge flows. Such sites tend to be established in order to enhance the core capabilities of MNCs by tapping knowledge from local environments. It would require high levels of technology-related knowledge flows.</p>
Home-base-exploiting	<p>To be established in order to support foreign manufacturing facilities or to adapt products to the foreign market. The most common for foreign R&D subsidiaries, aiming at the development end of the R&D spectrum. It would require high levels of market-related knowledge flows (because such sites need to develop products/services tailored to local customers’ needs)</p>

2.5 Hypotheses

No.	Hypotheses
H1	Home-base- augmenting R&D subsidiaries are likely to promote technology-related knowledge flows among the subsidiary, its parent company, other subsidiaries, and its local environment.
H2	Home-base- exploiting R&D subsidiaries are likely to promote market-related knowledge flows among the subsidiary, its parent company, other subsidiaries, and its local environment.
H3	Home-base- augmenting R&D subsidiaries are likely to promote vertical knowledge flows between the subsidiary and its parent company.
H4	Home-base- exploiting R&D subsidiaries are likely to promote horizontal knowledge flows between the subsidiary and other subsidiaries.
H5	The more active in R&D alliances is an R&D subsidiary, the higher the technology-related knowledge flows among the subsidiary, its parent company, other subsidiaries and its local environments.
H6	The more active in R&D alliances is an R&D subsidiary, the higher the knowledge flows from its local environments to the subsidiary .

2.5 Hypotheses

No.	Hypotheses
H7	The more process-oriented (rather than outcome-oriented) incentive practices an R&D subsidiary employs, the higher the knowledge flows between the subsidiary and its parent company
H8	The more autonomous is an R&D subsidiary, the lower the knowledge flows between the subsidiary and its parent company
H9	The more autonomous is an R&D subsidiary, the higher the knowledge flows from its local environments to the subsidiary
H10	The higher the knowledge flows among an R&D subsidiary, its parent company, other subsidiaries, and its local environments, the higher the level of knowledge the subsidiary tends to accumulate .
H11	The higher the level of knowledge an R&D subsidiary accumulates , the higher the subsidiary's performance .

Triangulation approach :

- **Quantitative :**

Survey data from 79 R&D subsidiaries by Japanese MNCs in the US. We collected data by surveying top management (CEOs or presidents) of R&D subsidiaries of Japanese R&D subsidiaries, complemented by publicly available data.

- **Qualitative :**

interview 30 subsidiaries and 10 MNC HQs.

3.2 Interview

Method

- 30 selected subsidiaries and 10 parent companies in Japan
- Limited time of interview (approximately 90–120 min)
- Using 5-point Likert-scales
- **7 questions:**
 - (1) R&D strategy, (2) autonomy, (3) knowledge flows from HQ to the subsidiary, (4) knowledge flows from the subsidiary to HQ, (5) knowledge flows from the subsidiary to other subsidiaries, (6) strength of corporate culture, and (7) the subsidiary's overall performance.
- **Found:**
 - (1) 50% of managers at HQs expressed concern that managers at overseas R&D sub-sidiaries might have overestimated their performance;
 - (2) knowledge flows from HQs to subsidiaries were seen as well managed in the automobile industry, while those flows were seen as poorly managed in the electronics and pharmaceutical industry
 - (3) MNCs with strong corporate culture tended to develop special methods to solve knowledge flow problems, supporting our assumption.

3.3 Variables

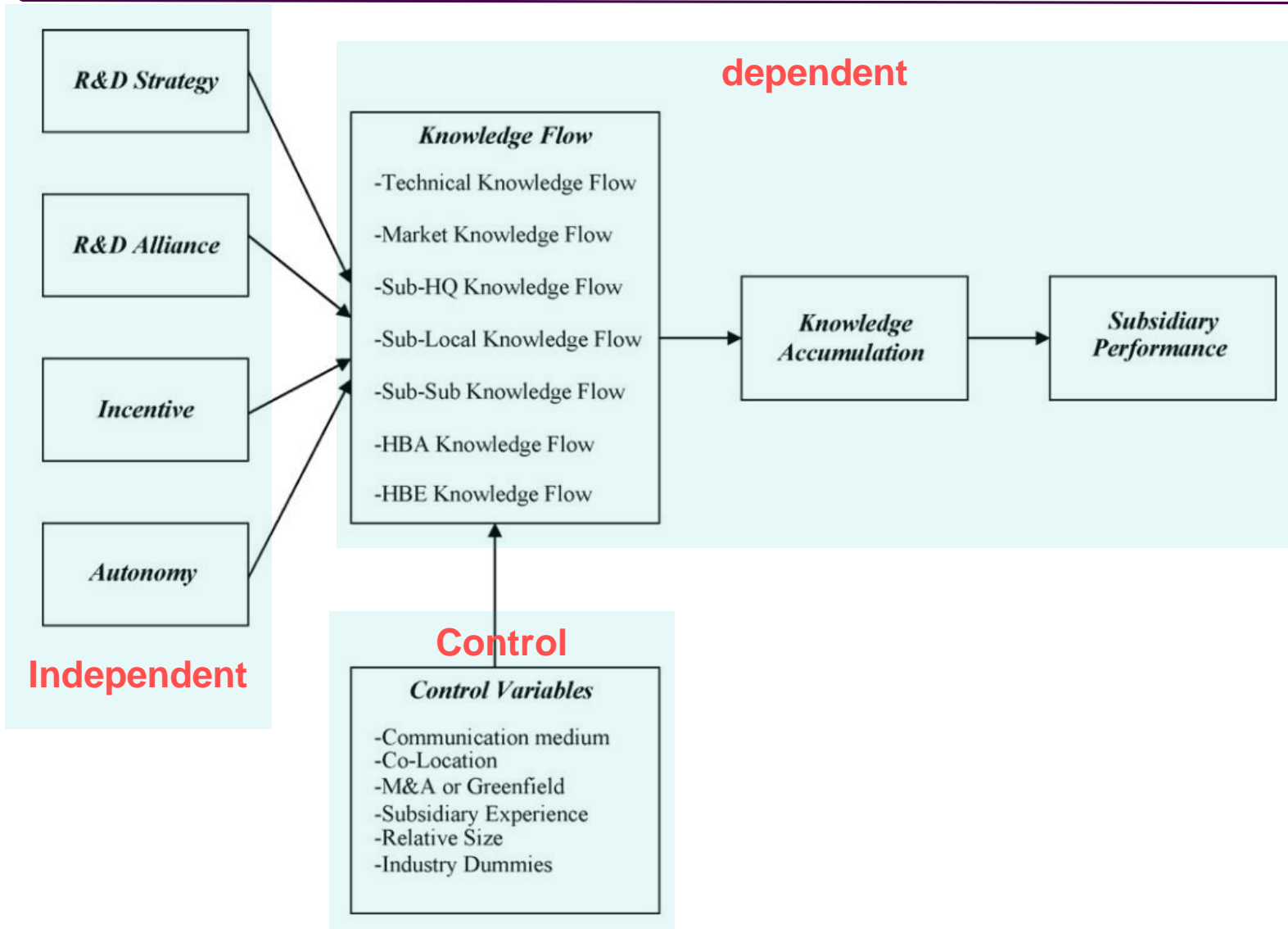
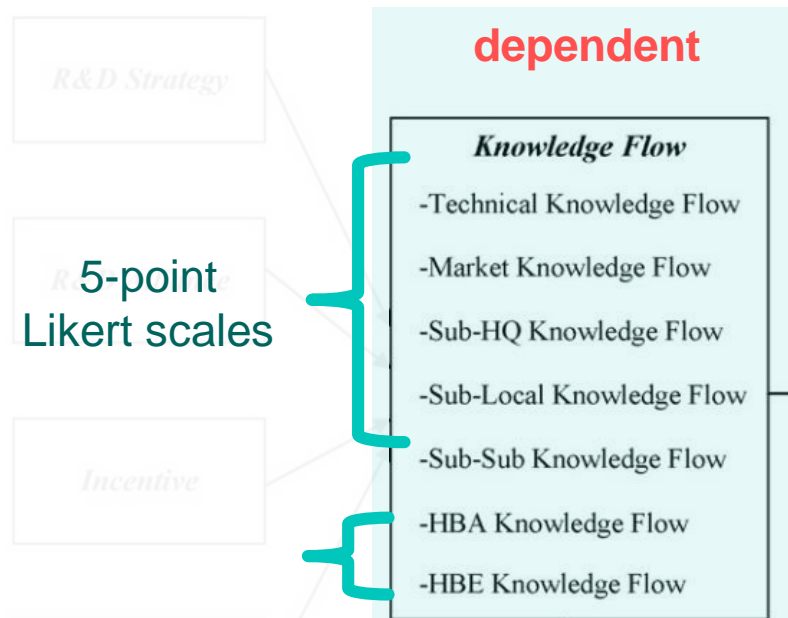


Fig. 1. Determinants of global knowledge flows and performance.

3.3.1 Dependent Variables

Method



Correlation analyses :

1. **Horizontal** knowledge flows, (i.e., between a subsidiary and other subsidiaries), tended to be **more reciprocal** than vertical knowledge flows, (i.e., between a subsidiary and HQ).
2. **Market-related** knowledge flows were **more reciprocal** than technology- related knowledge flows.

Factor Analysis to 3 factors :

1. Sub-Sub Knowledge Flow (confirming our hypothesized typology.)
2. **HBA** (Home-Base Augmenting) Knowledge Flow : (1)technology-related knowledge flows from local environments to the subsidiary, (2) market-related knowledge flows from local environments to the subsidiary, and (3) technology-related knowledge flows from the subsidiary to HQ.
3. **HBE**(Home-Base Exploiting) Knowledge Flow : (1) technology-related knowledge flows from HQ to the subsidiary, (2) market-related knowledge flows from HQ to the subsidiary, (3)market-related knowledge flows from the subsidiary to HQ

3.3.2 Independent Variables

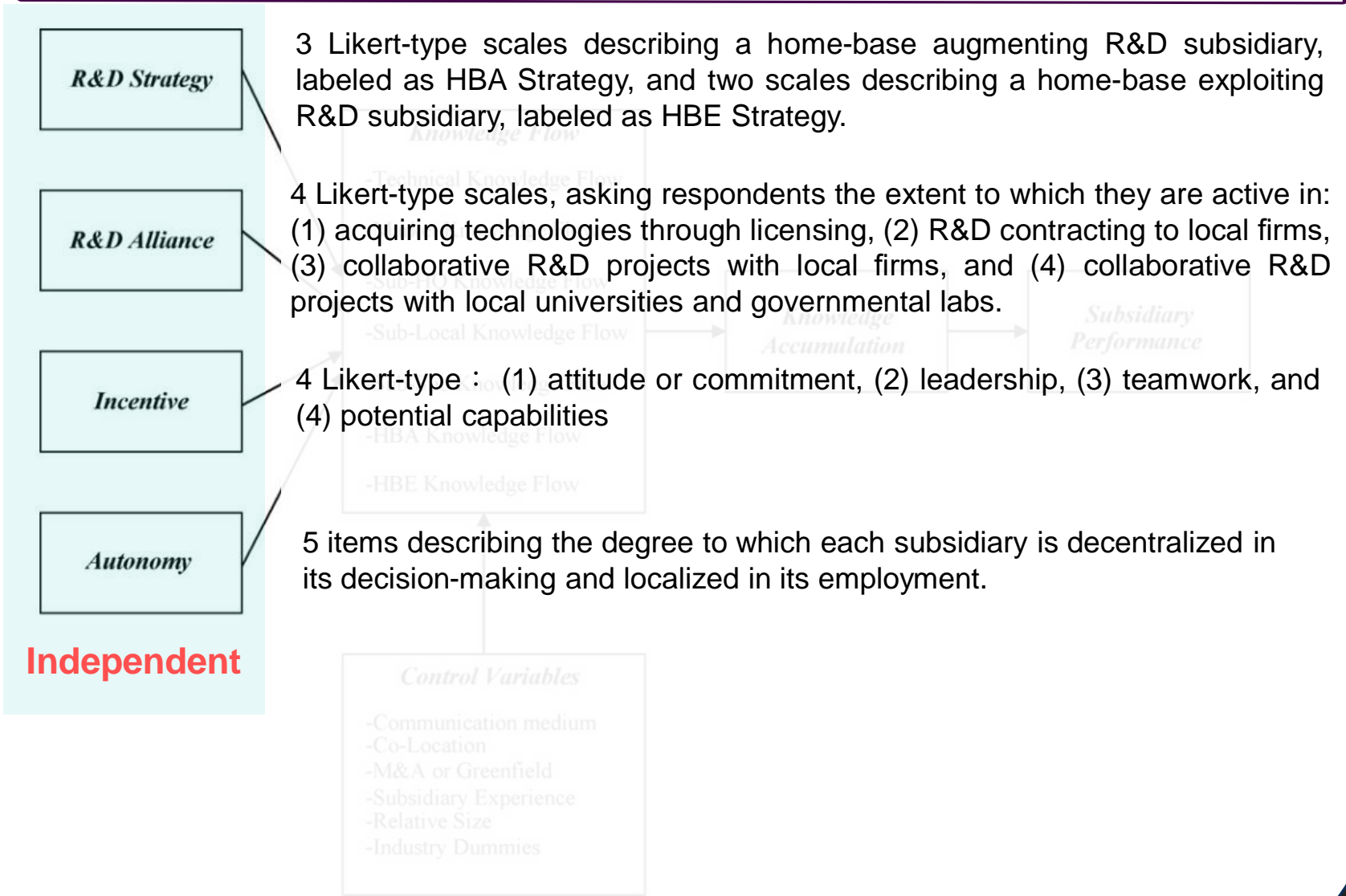


Fig. 1. Determinants of global knowledge flows and performance.

3.3.3 Control Variables

- **Communication Medium**: knowledge flows through adequate communication methods—e.g., face-to-face meeting, emails, TV conference
- **Co-location(a dummy)** : overseas Japanese R&D facilities are often located with their manufacturing or marketing facilities.
- **Merger/acquisition or greenfield(dummy)** development are the two most common methods of establishing R&D subsidiaries abroad
- **Experience** was included by measuring the number of years an R&D subsidiary had been established in the US. (longer established, more efficient)
- **Relative Size** i.e., the size of the MNC subsidiary compared with the size of the MNC (larger the relative size, the stronger strategic position)
- **Industry dummies** three dummy variables representing these three industries were also included.

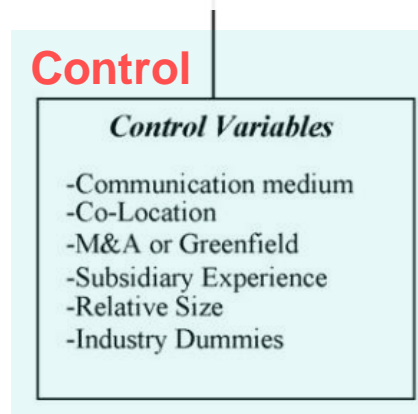


Fig. 1. Determinants of global knowledge flows and performance.

3.3.4 Knowledge accumulation and performance

Method

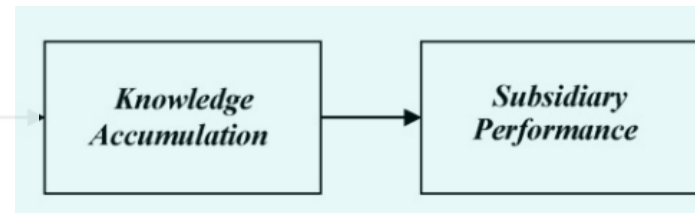
Knowledge Accumulation

Quantitative :

- (1) the number of published
- (2) the total number of patents awarded, copyrights awarded, and new products/services by utilizing knowledge developed in a subsidiary

Qualitative :

Three Likert-type question items, by asking respondents qualitatively about the level of knowledge accumulation at each subsidiary



Subsidiary performance

Seven Likert-type questions, asking respondents the extent to which their subsidiary had been successful in technologies, speed, technical goals achieved, financial goals achieved, technical contributions to their parent company, financial contributions to their parent company, and overall assessment of a subsidiary's R&D performance.

4 .Hypotheses & Discussion

Results

Summary of results

#	Hypotheses and assumptions	Survey results (N = 79)	Interview results (N = 30)
Hypothesis 1	<i>Home-base-augmenting</i> R&D subsidiaries are likely to promote technology-related knowledge flows among the subsidiary, its parent company, other subsidiaries and its local environment.	✗ Not supported	N/A
Hypothesis 2	<i>Home-base-exploiting</i> R&D subsidiaries are likely to promote market-related knowledge flows among the subsidiary, its parent company, other subsidiaries and its local environment.	✓ Supported	N/A
Hypothesis 3	<i>Home-base-augmenting</i> R&D subsidiaries are likely to promote vertical knowledge flows between the subsidiary and its parent company.	✗ Not supported	✗ Not supported
Hypothesis 4	<i>Home-base-exploiting</i> R&D subsidiaries are likely to promote horizontal knowledge flows between the subsidiary and other subsidiaries.	✓ Supported	✗ Not supported
Hypothesis 5	The more active in R&D alliances an R&D subsidiary is, the higher technology-related knowledge flows among the subsidiary, its parent company other subsidiaries and its local environments.	✓ Supported	N/A
Hypothesis 6	The more active in R&D alliances an R&D subsidiary is, the higher knowledge flows from its local environments to the subsidiary.	✓ Supported	N/A
Hypothesis 7	The more process-oriented (rather than outcome-oriented) incentive practices an R&D subsidiary employs, the higher vertical knowledge flows between the subsidiary and its parent company.	✓ Supported	N/A
Hypothesis 8	The more autonomous an R&D subsidiary is, the lower vertical knowledge flows between the subsidiary and its parent company.	✗ Not supported	✗ Not supported
Hypothesis 9	The more autonomous an R&D subsidiary is, the higher knowledge flows from its local environments to the subsidiary.	✓ Supported	N/A
Hypothesis 10	The higher knowledge flows among an R&D subsidiary, its parent company, its local environments and other subsidiaries, the higher level of knowledge the subsidiary tends to accumulate.	Partially supported	N/A
Hypothesis 11	The higher level of knowledge an R&D subsidiary accumulates, the higher the subsidiary's performance.	Partially supported	N/A
Assumption 1	The higher level of knowledge flows, the higher a subsidiary's performance.	Not supported	Partially supported
Assumption 2	Knowledge flows are cost-involving activities.	Partially supported	Partially supported
Assumption 3	Knowledge flows are reciprocal.	Partially supported	Not supported

5. Conclusion

- Contributions
 - Triangular approach
 - **Three-step model** : (1) identified factors affecting knowledge flows ; (2) examined the extent to which knowledge flows lead to knowledge accumulations ; (3) we examined the extent to which knowledge accumulations lead to sub-sidiaries' overall performance.
 - High level of knowledge accumulations, and a high level of knowledge accumulations lead to high performance.
- Managerial implications
 - the defined control variables—e.g., communications medium, co-location, M&A, and experience—generally do not affect knowledge flows, knowledge accumulations, or subsidiaries' overall performance. Thus, our data analyses suggest that knowledge flows are likely to be determined by managerial factors (i.e., strategic factors and organizational factors) more than contextual factors (i.e., control variables).

5. Conclusion

○ Limitations

1. We indicated that Japanese R&D subsidiaries in the US represent the largest population, the largest population does not necessarily represent the average population
2. Characteristics of that knowledge
3. The importance of interpretative capacity ,we did not measure such a capacity.
4. We focused mainly on the “nodal” level
5. We didn't examine it from a historical or long-term perspective
6. We did not investigate the joint

○ directions for future research

1. Focus on human resource management (HRM)-related and R&D management-related issues, such as training and development activities for R&D personnel and expatriates in HQs
2. A second line of productive inquiry would be to examine
3. German or Korean R&D facilities in the US or Europe, as well as Japanese R&D subsidiaries in Asia or Europe

6. Supplement information

- Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic management journal*, 17(S2), 109-122. Cited by 15917

Given assumptions about the characteristics of knowledge and the knowledge requirements of production, the firm is conceptualized as an institution for integrating knowledge. The primary contribution of the paper is in exploring the coordination mechanisms through which firms integrate the specialist knowledge of their members. In contrast to earlier literature, knowledge is viewed as residing within the individual, and **the primary role of the organization is knowledge application rather than knowledge creation.**

1. Transferability 可轉移
2. Capacity for aggregation 整合能力
3. Appropriability 專用性
4. Specialization in knowledge acquisition 知識獲得專門化
5. The knowledge requirements of production 生產所需要知識

6. Supplement information

Gupta, A. K., & Govindarajan, V. (1991). Knowledge flows and the structure of control within multinational corporations. *Academy of management review*, 16(4), 768-792. Cited by 2069

Variations in Subsidiary Strategic Contexts: A Knowledge Flows–Based Framework

Outflow of knowledge from the focal subsidiary to the rest of the corporation	High	Global Innovator	Integrated Player
	Low	Local Innovator	Implementor
		Low	High

**Inflow of knowledge
from the rest of the corporation
to the focal subsidiary**