

RESEARCH MONEY Conference

Technology Clusters: By Accident or Design?

Clustering: A Contact Sport

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Knowledge-Based Industrial Cluster

- **No clear definition**
- ***Could be:***
 - *region* (Silicon Valley)
 - *technopole* (Ottawa)
 - *industrial research park* (Hsinchu)
- **Common features: *proximity* and *linkages* among the players.**

Industrial Clustering: The Theory

- No firm captures all the economic benefits of its innovation process;
- “Spillovers” can be captured by other firms;
- Geographical proximity of firms increases the potential of capture; and
- A supportive local infrastructure nurtures the process.

Some Canadian Clusters

- *Montréal*: IT, Biotech, Multimedia, Aerospace
- *Ottawa*: IT, Telecom, Photonics
- *Toronto*: IT, Biotech, Multimedia/Film, Finance
- *Kitchener-Waterloo*: IT
- *Saskatoon*: Biotech
- *Calgary*: IT, Telecom
- *Vancouver*: IT, Film

Even Our Largest Clusters are Relatively Small

See our IT clusters for example;

Municipality

Private Sector Employment

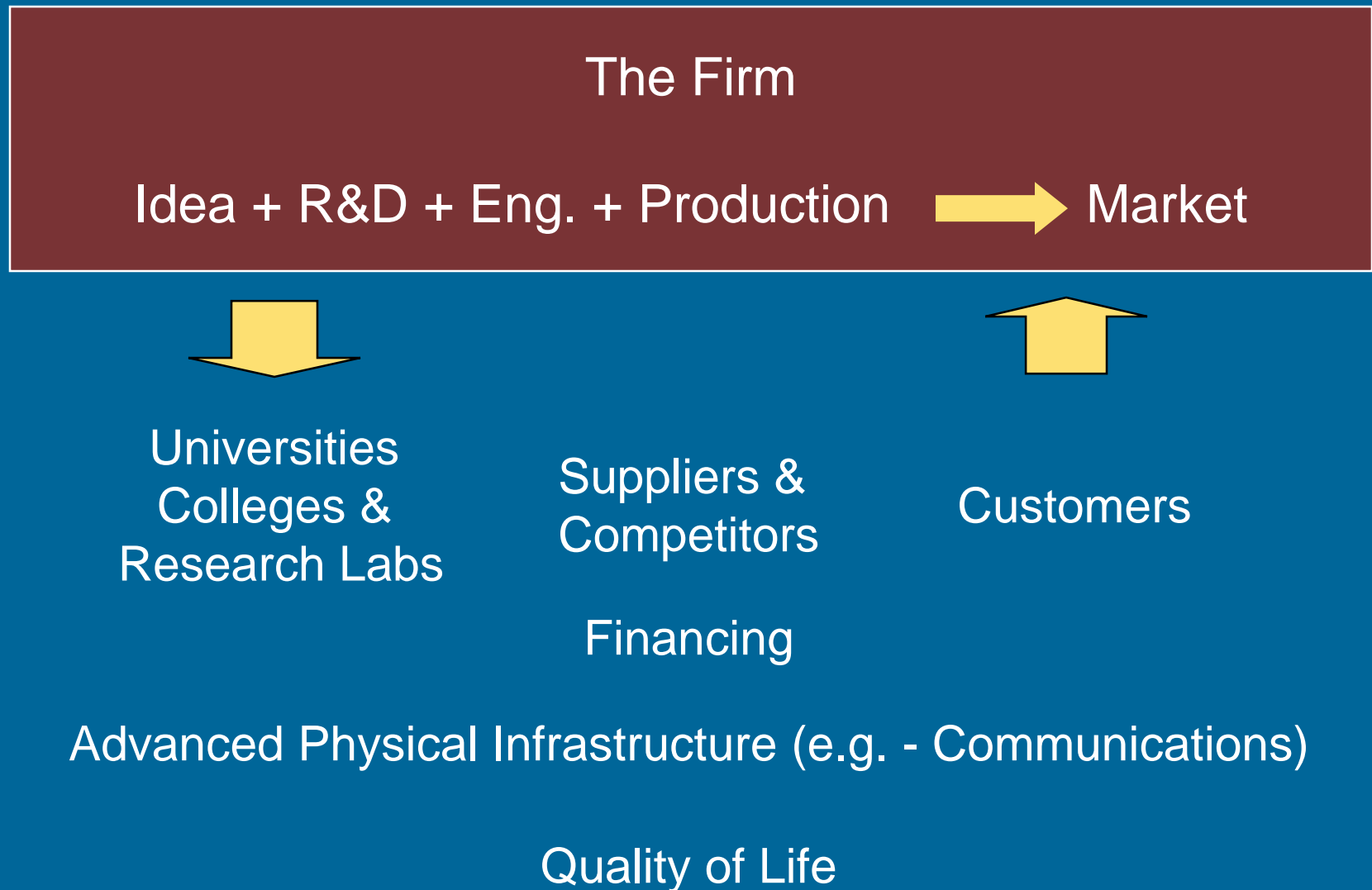
(firms with more than 100 employees)

• Silicon Valley, CA	1	300,000
• New York	2	170,000
• Boston	3	145,000
• Dallas	4	120,000
• Los Angeles	5	110,000
• Washington, DC	6	100,000
• Toronto	7	90,000
• Chicago	8	80,000
• Montreal	9	70,000
• Atlanta	10	60,000
• Philadelphia	11	50,000
• Houston	12	45,000
• Seattle	13	40,000
• Ottawa-Gatineau	13	40,000

IPOs In Information Technology & Biotech (1995-99)

More than 100	New York, San Francisco
50-99	Boston, Los Angeles, Washington DC
25-49	Atlanta, Dallas, Montreal , Philadelphia Seattle, Toronto
Less than 25	Chicago, Detroit, Houston, Miami Ottawa-Gatineau

Innovation Process in High-Technology Firms



Recognition of Potential by Local Leaders

Recognition of the Opportunity Usually Comes out of Meeting a Need:

- Terman wanted job opportunities for Stanford Graduates in California;
- Frêche wanted to diversify the Montpellier economy from tourism; and
- Japan's Technopolis program was aimed at regional development and alleviating pressure on Tokyo.

Support of Specific Local Strengths and Assets

- Technological strengths (universities, government laboratories and major firms);
- Local market strengths (e.g.- government procurement, banking); and
- Social, cultural and entertainment infrastructure are important assets because skilled people are 'Foot-Loose' and migrate to areas with good quality of life.

Champions are Important

- *Individuals* (e.g., Terman, Kozmetsky, Lafitte, Frêche)

or

- *Institutions* (e.g., Chambers of Commerce, Economic Development Groups)

Entrepreneurial Drive

- Central to firm and cluster development;
- Found in individuals whether they are growing firms (e.g., Terry Matthews of Newbridge/March Systems) or in supporting organizations (e.g., Gerry Turcotte in the early days of OCRI); and
- Where it is weak clusters stagnate (e.g., Tsukuba, Sophia-Antipolis).

Various Sources of Financing

- Full spectrum of instruments is needed;
- Angel and venture capital and government funds at the start-up phase; and
- Debt/equity instruments for the growth where about \$1 of working capital is needed to support \$1 of sales.

Information Networks

- Can be:
 - ❑ **Informal** where the focus is on the transfer of tacit knowledge (e.g., Il Fornaio Restaurant in Palo Alto; Starbucks at Pinecrest Mall in Ottawa)
 - ❑ **Formal** (e.g., Industry Associations, Chambers of Commerce)
- Where such structures are weak clustering suffers (e.g., Route 128)

Educational & Research Institutions

- Necessary to provide skilled people and technological expertise;
- But, not sufficient for success unless there are strong linkages to industry (e.g., Silicon Valley); and
- Where linkages are weak clustering stagnates (e.g., Taedok, Baltimore).

Staying Power

- It can take 30 (+) years for a cluster to reach maturity (e.g., Ottawa);
- Growth can be supported through sustained government support (e.g., Hsinchu); and
- Growth can also be accelerated by attracting the design functions of multinational firms (e.g., Bangalore).

Eight Characteristics of Success

- Recognition of Potential by Local Leaders
- Support of Specific Local Strengths and Assets
- Influence of Champions
- Entrepreneurial Drive
- Various Sources of Financing
- Information Networks
- Educational & Research Institutions
- Staying Power

Four Models

- Laissez-Faire: Ottawa, Canada
- Planned: Hsinchu, Taiwan
- Design Centres of MNEs: Bangalore, India
- Production Functions of MNEs: Ireland

Ottawa - A Laissez-Faire Cluster

- The Ottawa cluster is a post-war phenomenon which now has some 1400(+) firms and 63,000 professionals, mainly in Telecommunications. 75% of Canada's Telecom research is undertaken in the region.
- The two main drivers were government laboratories and Nortel Networks. The two universities became players only recently.

Ottawa - A Laissez-Faire Cluster (cont'd)

- Local government recognized the potential only in the 1980s and established the Ottawa Centre for Research and Innovation (OCRI) in 1984 to stimulate interactions among the players.
- The cluster is remote from major markets. Its focus is mainly design rather than production.

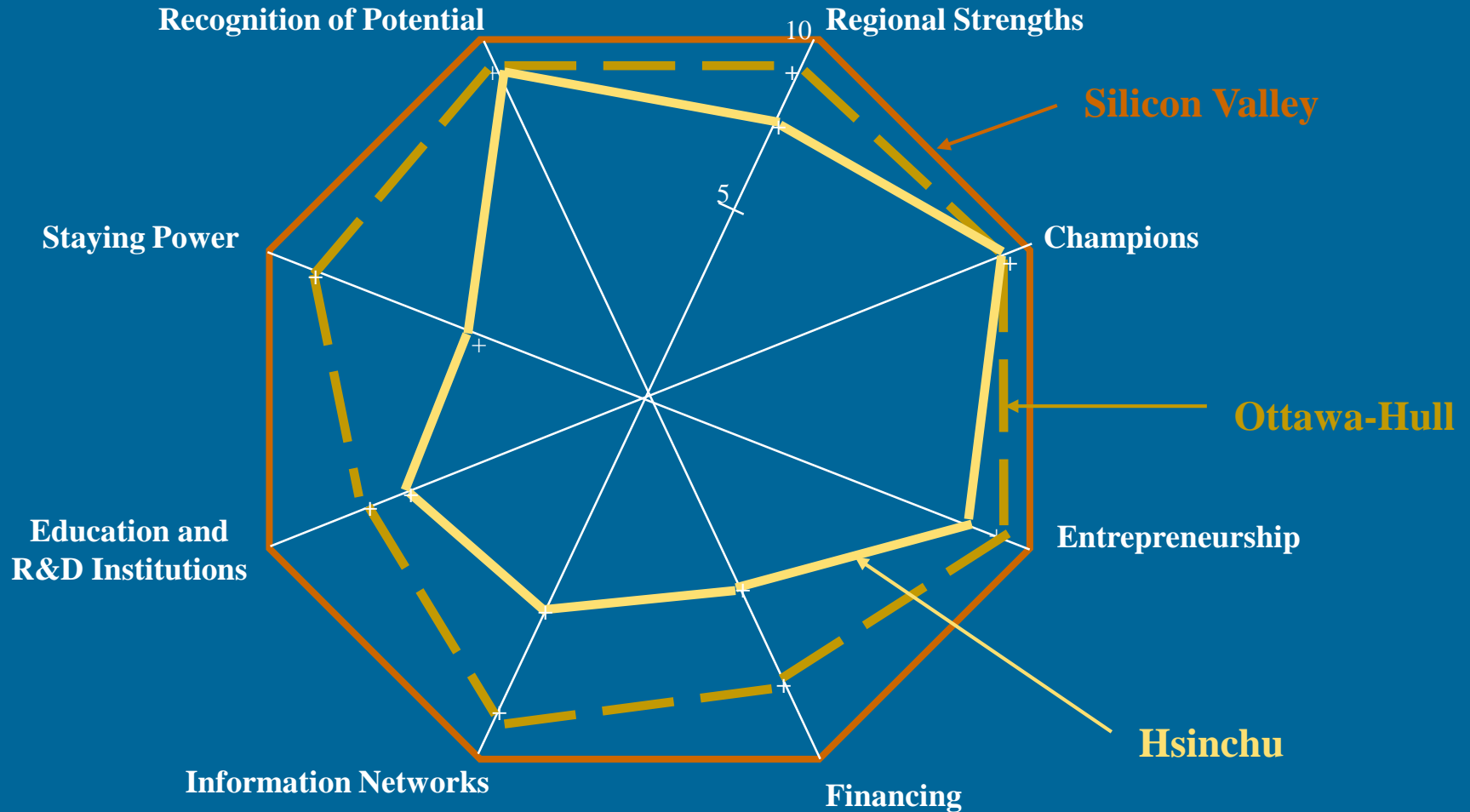
Ottawa - A Laissez-Faire Cluster (cont'd)

- *Recognition of Potential by Local Leaders:* a relatively recent phenomenon;
- *Support of Specific Local Strengths and Assets:* government labs, Telecom R&D, quality of life;
- *Influence of Champions:* McClaren brothers, Denzil Doyle;
- *Entrepreneurial Drive:* developed over the years;

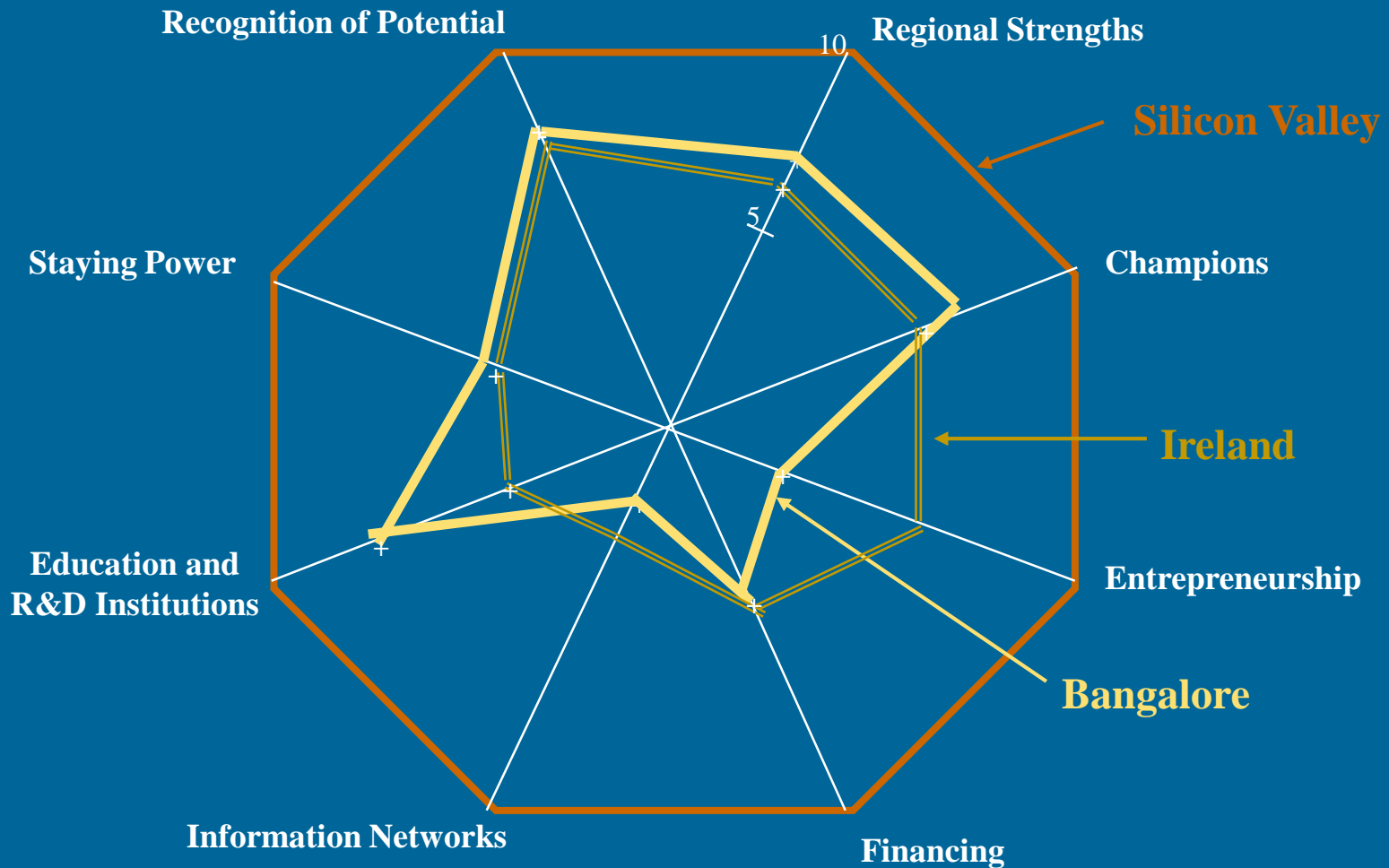
Ottawa - A Laissez-Faire Cluster (cont'd)

- *Various Sources of Financing*: full spectrum of mechanisms;
- *Information Networks*: well developed through OCRI;
- *Educational and Research Institutions*: two universities; two colleges; concentration of government and private sector laboratories; and
- *Staying Power*: 50 (+) years.

Relative Status of Three Clusters



Relative Status of Three Clusters



Some Lessons and Directions

- The eight characteristics of success need to work together at the level of the cluster;
- Laissez-faire clusters take a long time to reach “critical mass”;
- Cluster development can be accelerated through planning and sustained support;

Some Lessons and Directions

- A commercial rather than a scientific orientation is needed to stimulate cluster development.
- Capture design functions of MNEs where possible; and
- Move to higher value-added functions in clusters where assembly / production functions dominate.