Technological Clusters, Knowledge Creation and Innovation

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M. Hosein Fallah, Ph.D.
Associate Professor
Wesley J. Howe School of Technology Management
Stevens Institute of Technology
Hoboken, NJ 07030
201-216-5018

Outline

- What is a Technology Cluster
- Why focus on clusters
- Technology Cluster Initiatives
- Our Research Direction
- Current findings
Technological Clusters

- Geographical concentration of related technology firms- competitors, suppliers, distributors, customers
- Usually around scientific research centers and universities
- Examples

Why Focus on Clusters?

Clustering can bring a wide range of benefits to both businesses involved and the wider economy of the region.

- Increased levels of expertise
- Ability of firms to draw together complementary skills
- Potential for economies of scale
- Strengthening social and other informal links
- Improved information flows within the cluster
- Enabling development of the infrastructure and support services
Economic Impact of Clusters

- Firms in clusters are more innovative than firms outside clusters
- Companies in a cluster benefit from knowledge exchange and spillovers which result in:
  - Higher rate of innovation
  - Job growth
  - Greater economic output

Interest In Cluster Development Strategies

- Strong interest Globally, promoted by Michael Porter's work on cluster and competitiveness
- Many states have initiatives in cluster development
- EU has developed guidelines and strategies for cluster development
- A global survey in 2003 identified 509 cluster initiatives
The Actors of a Cluster

Government  Financial Institutions

Institutions For Collaboration

Academia  Industry

Technological Clusters & Knowledge Creation

- While innovations are usually realized by companies, the ideas and inventions that lead to them can always be tracked back to an individual or a group of people’s knowledge creation efforts.
- The knowledge creation process is stimulated by the need to solve problems.
- Knowledge is created and enhanced through repeated iterations of knowledge exchange whether tacit or explicit
- Clusters increase interactions among people which facilitate knowledge creation
Transformation of Knowledge to Invention and Innovation

Tacit + Explicit Knowledge

Invention

Innovation

Internalization

Tacit Knowledge

Explicit Knowledge

Knowledge Accessibility

Un-accessed Knowledge

Individual Tacit Knowledge

Accessed through Externalization

Non-codified

Codified

Explicit knowledge

Group Tacit Knowledge

Accessed and absorbed through Experience

Internalization

Accessible through direct interaction
Knowledge Creation and Exchange in Technological Clusters

- Individuals working for different companies in a cluster exchange knowledge
- Companies share knowledge as part of an alliance or a joint venture, informal interactions between employees, customer supplier relationship, outsourcing of activities or functions
- Knowledge exchange and creation take place at a higher rate in technological clusters

Direct interaction is critical for the exchange of tacit and non-codified explicit knowledge

Knowledge Creation and Exchange in Technological Clusters (cont.)

\[ E = \text{Externalized Knowledge} \]
\[ T = \text{Tacit Knowledge} \]

- Socialization
- Externalization
- Absorption
- Internalization

Transfer Spillover

Group Tacit Knowledge

Individual Tacit Knowledge

Cognitive ability

Externalized Knowledge

Tacit Knowledge
Our Research Direction

- Understanding the drivers of innovation in technological clusters
- Study cluster performance and metrics
- Consider effects of
  - Off-shoring of value-chain functions
  - Globalization of innovation process
  - Global IT infrastructure
- Application area: Reinvigorate the Telecom R&D in NJ

Research Questions

- What specific knowledge exchange mechanisms are used by the innovators to access external knowledge for their inventions?
- To what extent do localization influence the use and effectiveness of these mechanisms?
- To what extent do knowledge spillovers in technological clusters influence the creative output of the cluster?
Data Collection

- Survey inventors from the telecommunications industry who are located in clusters and compare their responses to inventors in the same industry but located outside clusters.
Preliminary Results

Mean Responses for Cluster vs. Non-cluster

- Cluster environment
- Organization environment
- Non-codified explicit knowledge
- Collective tacit knowledge
- Individual tacit knowledge
- Collective tacit knowledge
- Non-codified explicit knowledge
- Codified explicit knowledge
- Non-codified explicit knowledge from company
- Collective tacit knowledge from company
- Individual tacit knowledge from company
- Codified explicit knowledge from company
- Knowledge spillovers within cluster
- Non-codified explicit knowledge within cluster
- Collective tacit knowledge within cluster
- Individual tacit knowledge within cluster
- Codified explicit knowledge within cluster

Summary

- A technology cluster is a concentration of related technology firms around research institutions
- Firms within clusters are more innovative than those outside clusters
- There is higher intensity of knowledge exchange, creation and spillovers within clusters which drive the increased innovation output
- Technological clusters contribute to economic growth of the region
- There are significant ongoing research to understand the mechanisms for cluster development
- The Howe School is conducting research on mechanisms that drive innovation in technology clusters
Questions?