The Development of a Cluster Leverage Model:

Strategies for Measuring Cluster Inputs

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CENTRE FOR PUBLIC MANAGEMENT

CENTRE DE GESTION PUBLIQUE INC.

Presentation Overview

- Context
  - Technology Clusters
  - Growth Trajectory
  - NRC Cluster Initiatives
- The Challenge
- The Model
- The Leverage Ratio
- Results and Conclusions
- Future Research

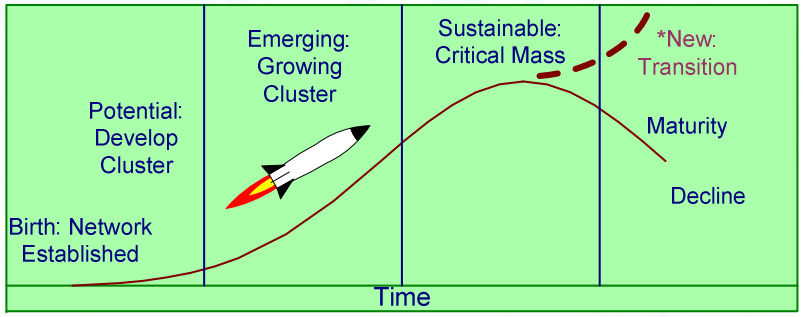
Context: Technology Clusters

- The effort to establish and grow a technology cluster is often complex and involves numerous parties, both public and private, as well as a number of intangible environmental factors.

Context: Growth Trajectory

- Cluster theory has charted a growth trajectory documenting the life of a technology cluster from birth to decline.
- Phases along the cluster lifespan include:
  - Birth: Establishment of the Network;
  - Cluster Growth;
  - Critical Mass;
  - Maturity; and
  - Decline

Figure: Cluster Growth Trajectory



Context: NRC Cluster Initiatives

- NRC lead Cluster Initiatives (CI) are aimed at developing regional capacity in science and technology based innovation, with a broader goal of supporting national economic growth.
- CIs support knowledge infrastructure as well as the process of clustering and may include a combination of the following elements:
  - Knowledge;
  - People;
  - Infrastructure;
  - Dollars; and
  - Branding.

The Challenge

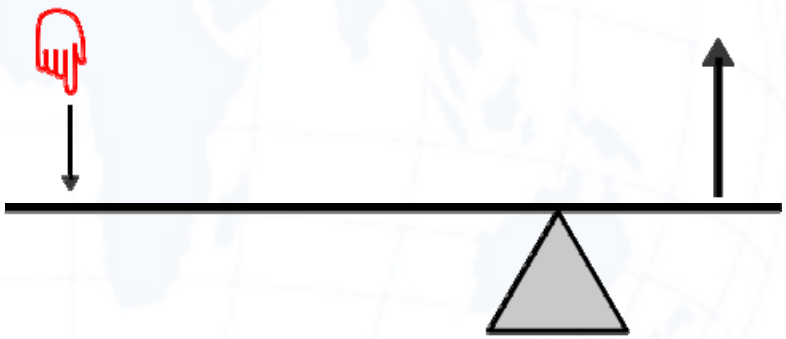
- The National Research Council (NRC) had been asked by Canadian Government central agencies to define the *leverage* of NRC's investment in technology clustering and assess the contributions made by other cluster members to the clustering effort.

- The Centre for Public Management Inc. sought to assist NRC in the development of a conceptual framework for assessing the inputs into the clusters, with a view to facilitate discussion and determining the overall leverage attributable to CIs at this time.

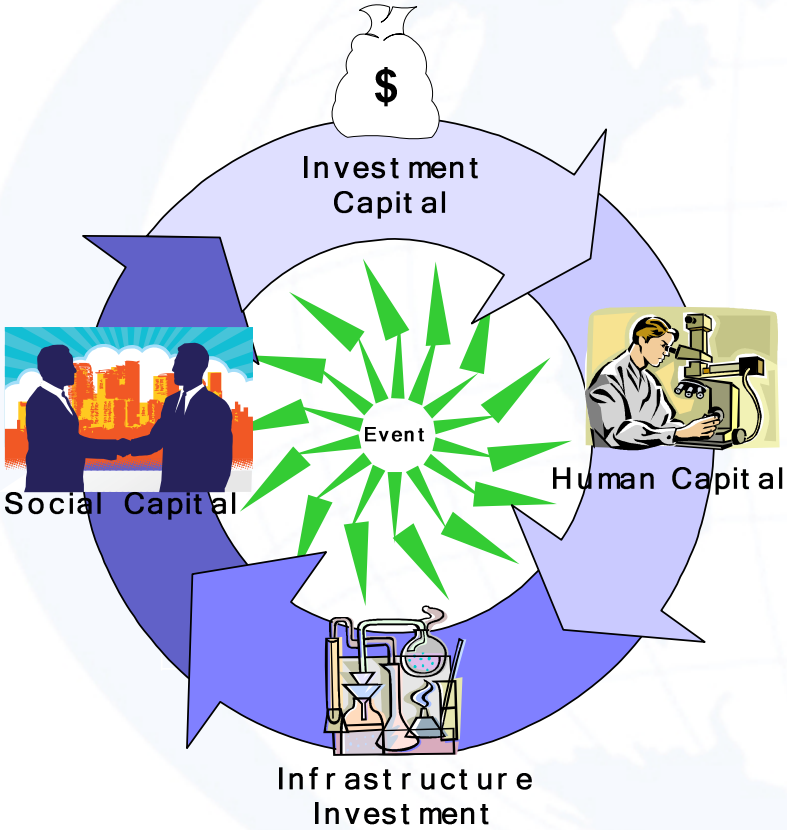
The Model: Concept

- A first-class lever is a lever in which the fulcrum is located between the input effort and the output load.
- In operation, a force is applied (by pulling or pushing) to a section of the bar, which causes the lever to swing about the fulcrum, overcoming the resistance force on the opposite side.
- The fulcrum may be at the center point of the lever as in a seesaw or at any point between the input and output.

Figure: First-Class Lever

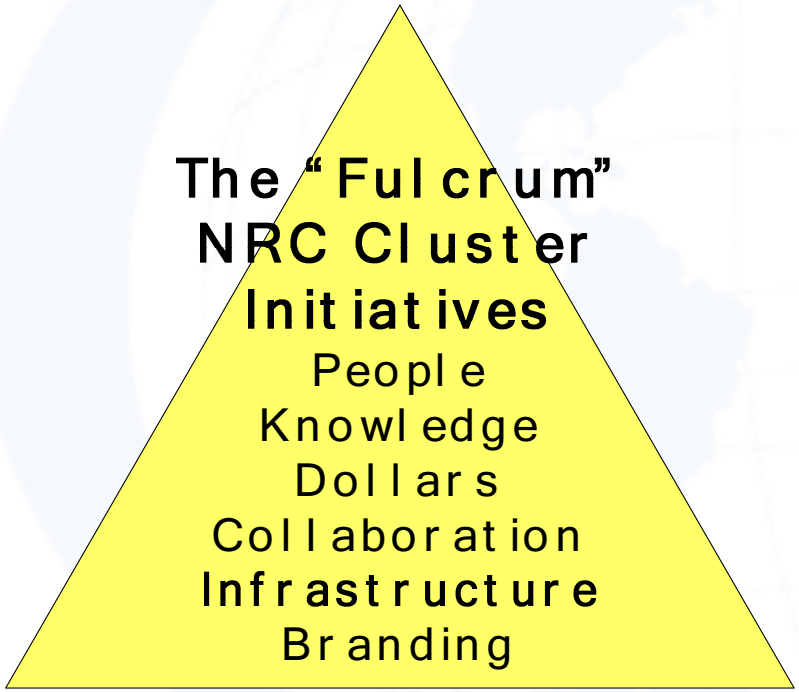


Model: Leverage Force



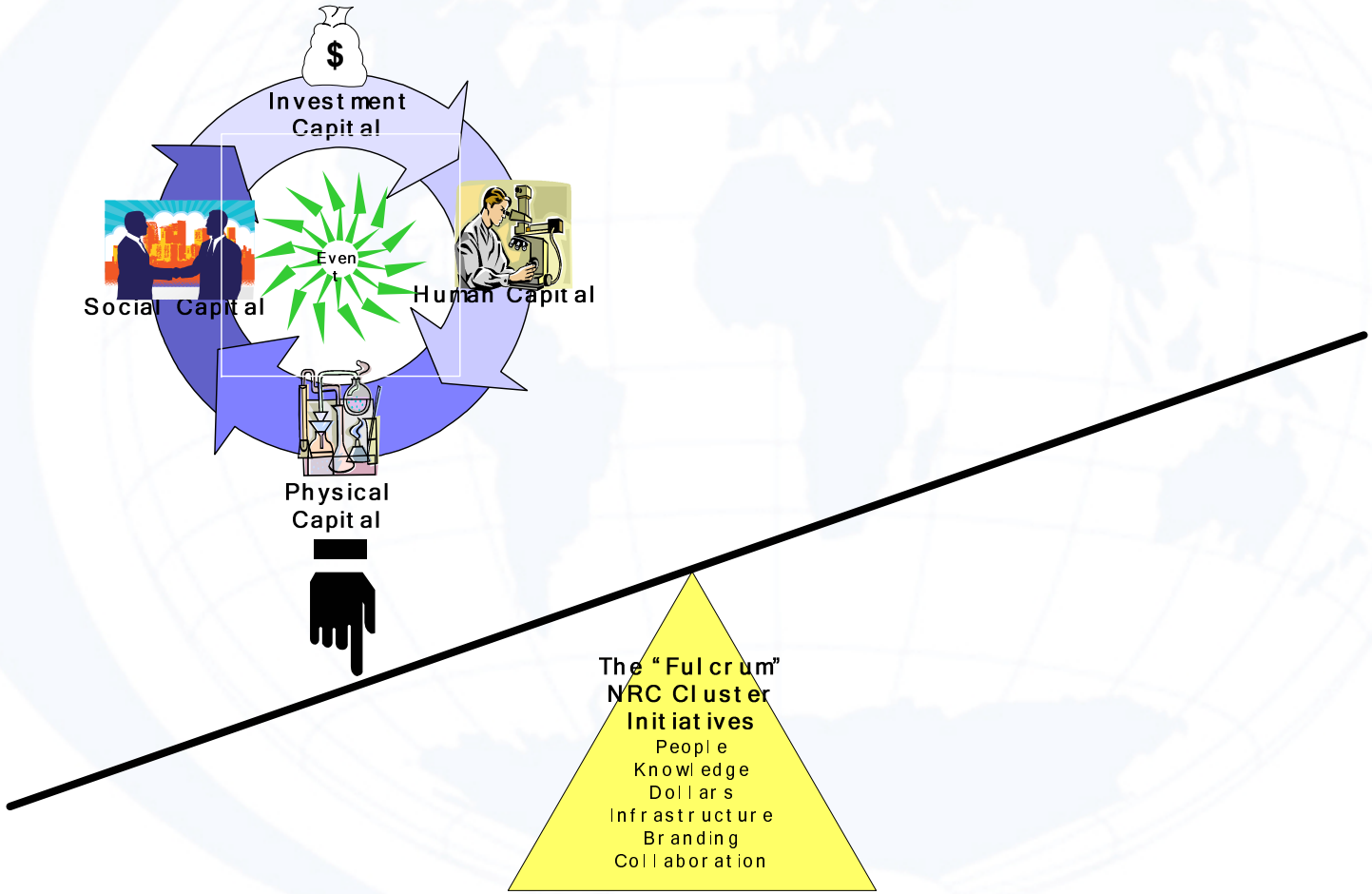
- The nucleus of the model is the "event" at the core of the circle.
  - The nature and type of event, or even multiples events, varies by cluster but should be thought of as the series of defining activities that first resulted in the emergence of a a technology focus or cluster at its most nascent point.
- "Leverage forces," at the left side of the model, highlight the leverage forces that may exist within a cluster at its initial or early state. These forces include:
  - Investment Capital;
  - Human Capital;
  - Physical Capital; and
  - Social Capital.

Fulcrum: NRC Cluster Initiatives

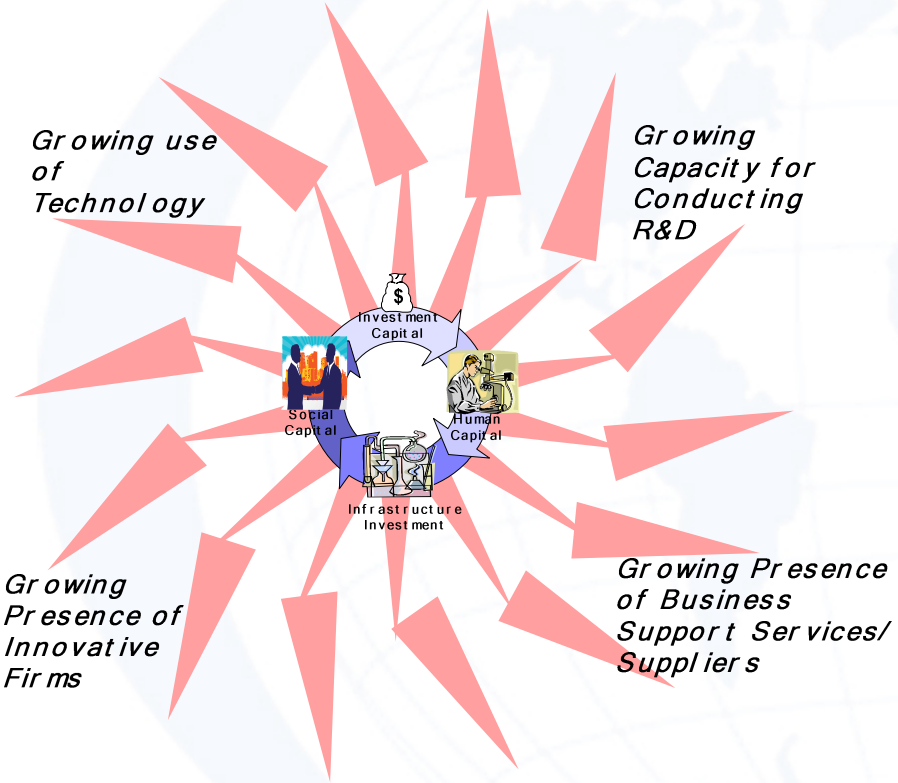


- NRC Cluster Initiatives act as the pivot point for the leverage defined above. Initiatives include:
  - People
    - HQP: Students
    - HQP: Visiting Workers
    - HQP: A-Base Staff
  - Knowledge
    - Intellectual Property (IP): Patents
    - Licenses
    - FFS: Fee for Service
    - CISTI CTI
  - Dollars
    - Grants
    - MOUs/Collaborative Agreements
  - Collaboration
  - Infrastructure
    - IPF: Rental
  - Branding

Model: Fulcrum

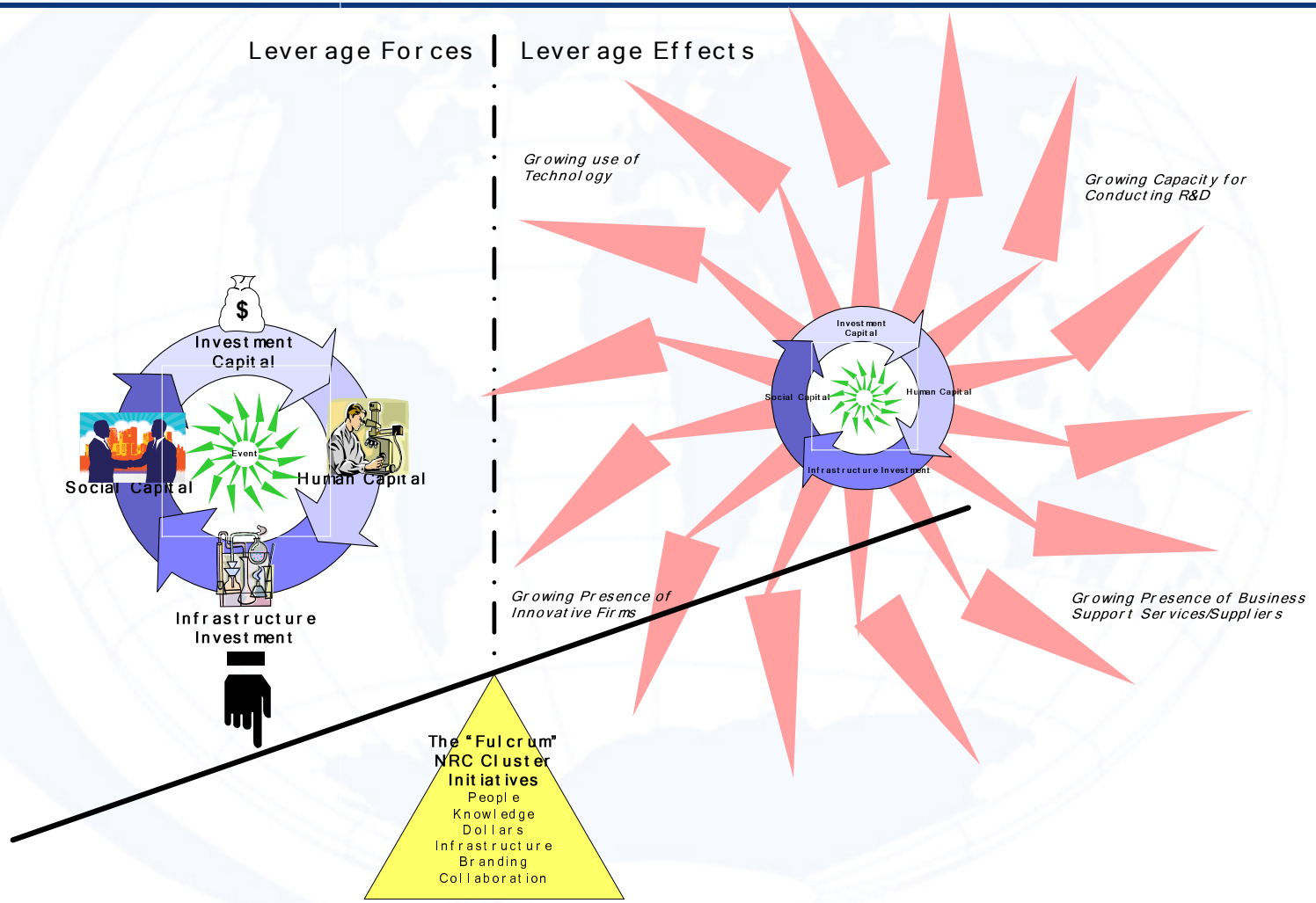


Model: Leverage Effects



- As represented pictorially on the left side of the framework, the Fulcrum, i.e., NRC CI investments, when acting in concert with the leverage forces, result in a series of leverage effects, namely:
  - Growing use of technology;
  - Growing capacity for conducting R&D;
  - Growing presence of innovative firms; and
  - Growing presence of business support services/suppliers.

Model: Combined



Case Study: Aluminum Transformation

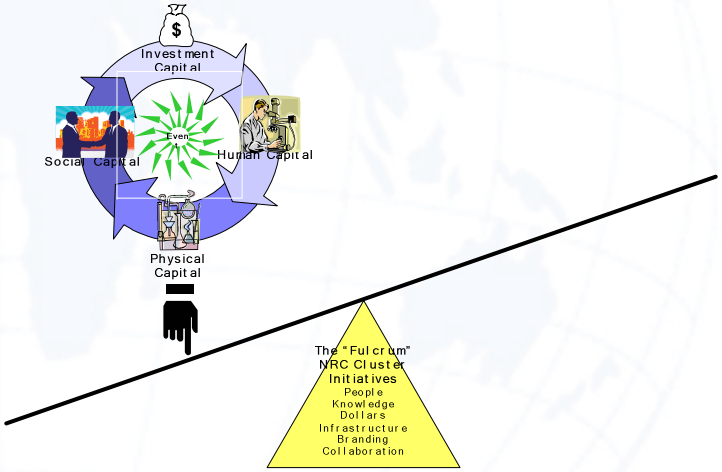
- **Event:**
  - Due to hydroelectric resource abundance and its accessibility via the St. Lawrence Seaway and Saguenay, as well as proximity to major markets, most Canadian aluminium smelting activities have historically been located in Quebec, the Saguenay Lac-St-Jean region in particular. The CI focuses on the development of secondary and tertiary production of aluminium products.
- **Leverage Force:**
  - Through six MOUs and 18 collaborative agreements, the CI has tapped into and partnered with the existing human and investment capital in the region, across the country, and around the world.
- **NRC Investment:**
  - The most pivotal element within NRC-ATC is its infrastructure (specialized equipment). Currently, NRC-ATC has specialized equipment on site worth approximately $7M, and on average purchases equipment for $1M annually. Human resources also constitute an important investment by NRC.
- **Leverage Effect:**
  - Through the leverage forces outlined above there is evidence of an enhancement in social capital, and collaboration and partnering within the cluster.

The Leverage Ratio

- Leverage Ratio = Leverage Force/Fulcrum
- The definition of leverage used in this study is informed by the NRC's RMAF data collection process.
  - *The ratio of cash and in-kind contributions from cluster actors, leveraged against the NRC CI initial and ongoing investments.*
- We define CI cluster actors as private firms, non-governmental organizations (NGOs) including non-profit organizations, academic institutions, other federal departments, and/or provincial and municipal governments.

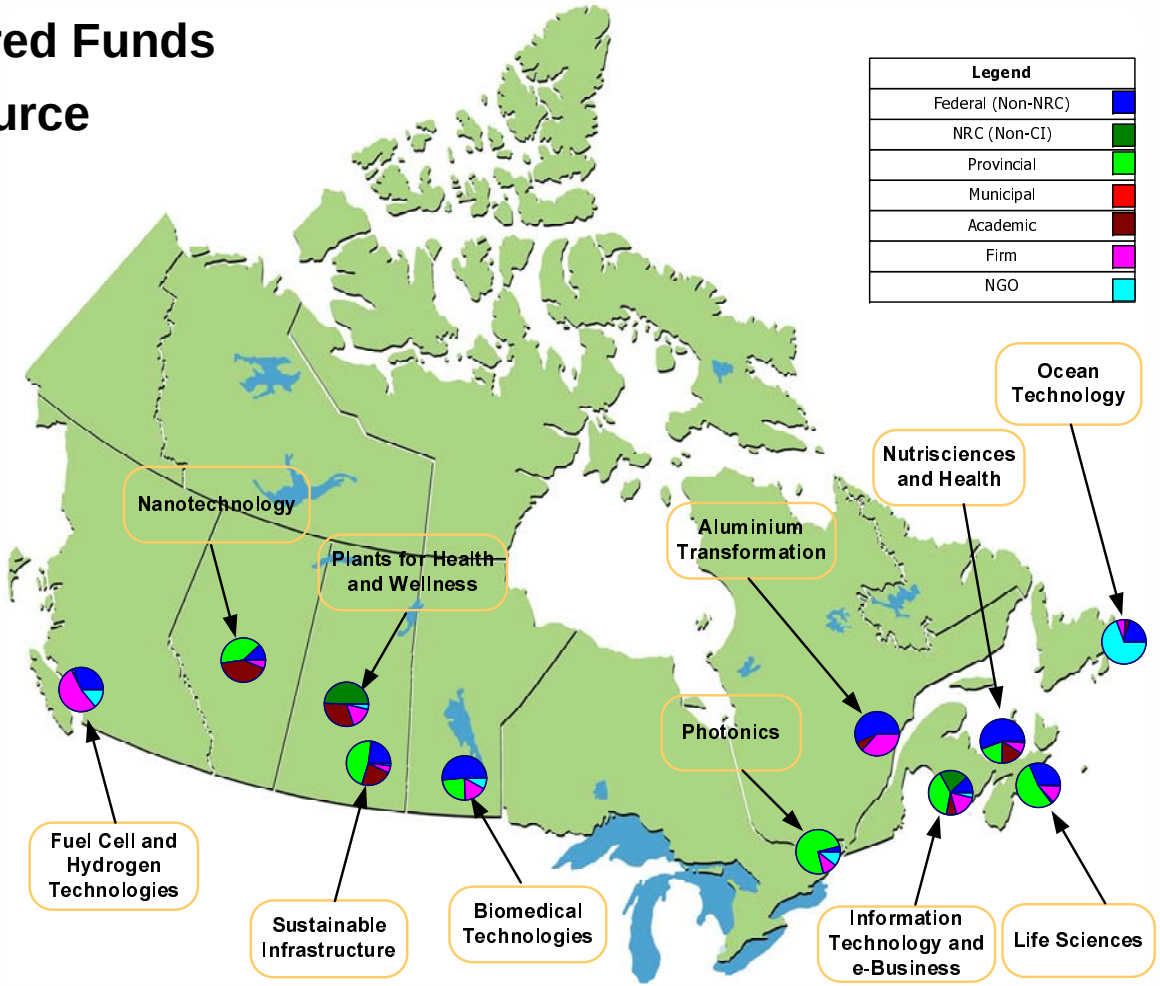
The Leverage Ratio: Tools

- Development of analytical tools to gain a further understanding of the components of leverage force and source of funds.
  - Federal;
  - Provincial;
  - Municipal;
  - Academic; and
  - Private Sector.



Results and Conclusions

Figure: Levered Funds by CI and Source



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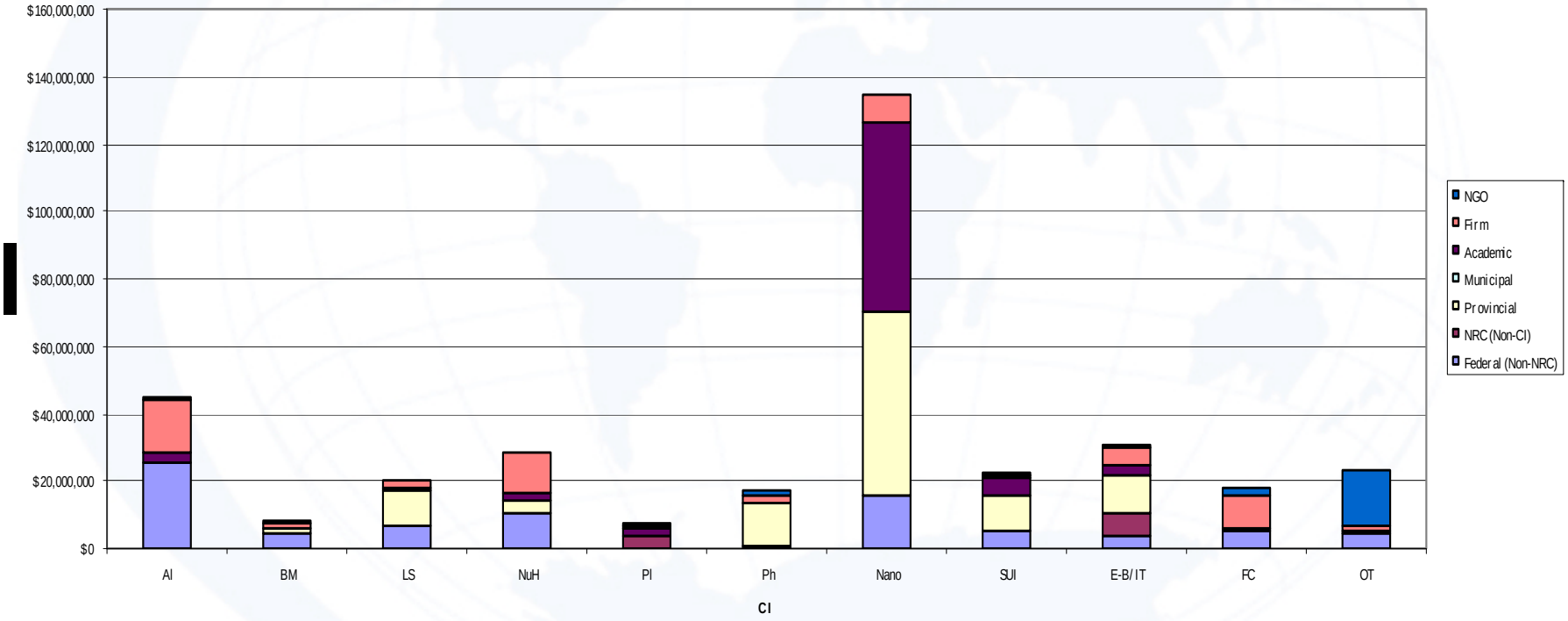

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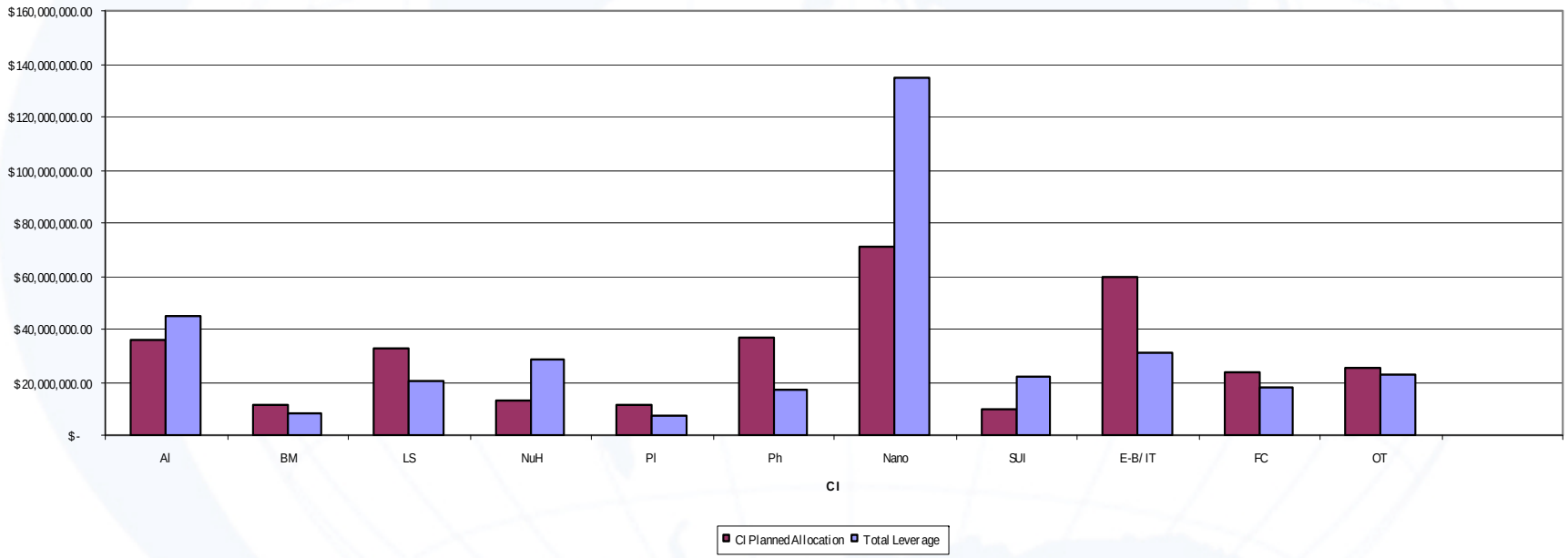
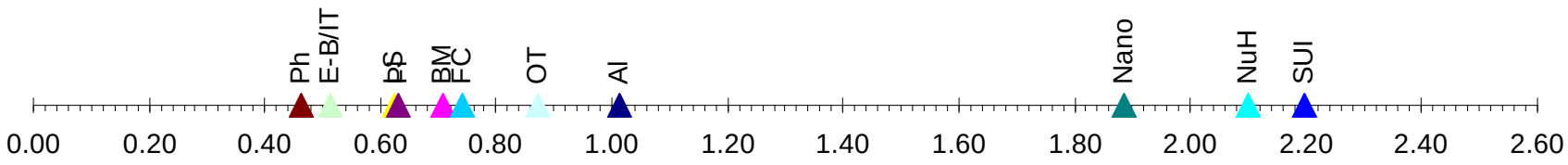
Figure: Planned CI Allocation and Levered Funds by CI



Results and Conclusions

Figure: Distribution of Leverage Ratios



Future Research

- Assessment of a change in the leverage ratio over time.
  - What can we expect?
  - Fulcrum dollars will grow. Will leverage forces grow at the same rate?
- Assessment of leverage effects.
  - What kind of data is available to gain a better understanding of leverage effect?
  - What ratios would give us additional insight into the concept of leverage?

Contact Information

- Shazmin Dosani
  Centre for Public Management Inc.
  Ottawa, Ontario
  Shazmin.Dosani@cpm.ca
  (613) 263-7892