

---

# Knowledge, Learning and Innovation in Ontario's ICT Clusters

**David A. Wolfe, Ph.D.**

Program on Globalization and Regional Innovation Systems  
Centre for International Studies  
University of Toronto

Presentation to the ONRIS/MEDT Workshop  
Delta Chelsea Hotel, Toronto  
October 21, 2004

Innovation Systems Research Network



---

# Workshop Questions

- Cluster strengths
  - What is working well in the cluster?
- Cluster challenges
  - What challenges do they face?
- Policy implications
  - What can be done to address the challenges?



---

# Ontario's ICT Clusters I

- GTA
  - 3362 firms across every 11 different segments of the sector
  - Employed 148,000 at end of 2003, down 20% from 2000
  - Key firms include headquarters of most major MNCs
    - Bell Canada, IBM, Rogers, Nortel, Celestica, Xerox, HP, EDS, AT&T, Motorola, Clearnet, SGI, Microsoft, Siebel, ATI, Gennum
  - 500 firms are active R&D performers – 6,600 researchers
    - IBM Software Solutions Lab – 2500 employees
    - Xerox Research Centre in Sheridan Park
  - Cluster is geographically dispersed
    - From Markham to Oakville
  - Multiple, competing industry associations,
    - representing different segments and interests
  - Large MNC presence means it is less domestically focused than Ottawa or Waterloo clusters



---

# Ontario's ICT Clusters II

- Ottawa
  - 1400 firms across four major segments
  - Origins linked to NRC labs and CRC
    - Fateful decision to locate BNR labs in 1958
  - Differentiated by strong research focus
    - 90 % of R&D in industrial telecommunications
  - Major firms
    - Newbridge (Alcatel), Nortel, Cisco, JDS, Corel, Mitel, Zarlink, Tundra, Mosaid
  - Supported by strategic federal policy – MSD program 1989
  - Dynamic photonics cluster
    - Strong links to PRO and NRC's Photonics Fabrication Facility
    - Recent formation of Ottawa Photonics Research Alliance
    - 52% of \$900 m in VC investment in Ottawa in 2001



---

# Ontario's ICT Clusters III

- Waterloo
  - 400 high tech firms employing 16,000
    - Second highest location quotient in Canada for employment in computer and electronic product manufacturing
  - Lead firms are largely indigenous offshoots
    - RIM, Open Text, Descartes, Mortice Kern Systems, ComDev
  - Dynamic role of U. of Waterloo
    - Entrepreneurial culture
    - Encourages spinoffs
  - Starting to emerge on VC's map
  - Reinvestment in research infrastructure
    - Perimeter Institute – theoretical physics



---

# Firm Capabilities I

- GTA
  - Strengths
    - Management experience
    - Access to outside markets
    - Diversifying product base
  - Weaknesses
    - Cooperation with public R&D and educational institutions
    - Limited local production activity – outside of software development
    - Cooperation with local firms to influence public policy



---

# Firm Capabilities II

- Ottawa

- Strengths

- R&D capabilities (Nortel, IBM CAS, etc.)
    - Management capabilities – trained by anchor firms
    - Monitoring of customers and competitors for innovative ideas
    - Firm creation – serial entrepreneurs acting like angels e.g. Denzil Doyle (Digital Canada), Terry Matthews (Newbridge affiliates program).
    - Cooperation with public R&D and educational institutions
    - Cooperation with local firms to influence public policy

- Weaknesses

- Diversity of customer base
    - Diversity of product offering
    - Impact of technology cycles



---

# Firm Capabilities III

- Waterloo
  - Strengths
    - Monitoring of market trends
    - Monitoring of technology trends
    - Product development
    - Product differentiation and customization
    - Strong local talent pool
    - Global market access
  - Weaknesses
    - Management experience and talent
    - Lack of new firm formation
    - More restricted access to capital





---

# Finance

- GTA
  - Strengths
    - Attracted second most VC (after Ottawa)
  - Weaknesses
    - Limited links of MNC's to local firms
- Ottawa
  - Strengths
    - Funding for firm start-up and early stage growth (VC funding, local angel investors, firm programs)
    - Attracted most VC among CMAs between 1998-2003
  - Weaknesses
    - Funding for later stage firm growth
    - Over concentration of VC funding
- Waterloo
  - Strengths ?
    - Emerging local angels and VC's
  - Weaknesses
    - Limited seed funding for new firms
    - Restricted access to VC funding for firm growth



---

# Talent I

- GTA
  - Strengths
    - Large diverse labour pool
    - Broad range of ICT-related higher education
      - 44 university-level ICT-related program in GTA
      - 39 college-level ICT-related programs in GTA
      - 76 private schools offering ICT training in the GTA
  - Weaknesses
    - Little strategic cooperation between firms and educational institutes to plan for future talent requirements
    - Labour shortages expected after 2008



---

# Talent II

- Ottawa
  - Strengths
    - Highly educated labor pool
    - Skilled people are attracted to the region for job opportunities
    - Local universities have recently coordinated efforts to supply needed talent
  - Weaknesses
    - Region's vulnerability to specific market shocks could lead to dispersion of talent
    - Lack of diverse employment opportunities
- Waterloo
  - Strengths
    - Thick labour market with an experienced work force and a robust supply of talent from the university.
    - Co-op program at U of W builds important connections between students and local industry
  - Weakness
    - Lack of managerial talent at the top level
    - Over reliance on local graduates – difficult to attract outsiders to the region



---

# Knowledge Generation I

- GTA
  - Strengths
    - Strong full-time R&D employment, most in development
    - Strong public R&D institutes – over 100 ICT-related research groups, centres and universities chairs in post-secondary institutions in the GTA
  - Weakness
    - Ability to commercialize new knowledge through firm creation or licensing
    - Limited collaboration between firms and public R&D institutes
    - Limited joint monitoring of the knowledge frontier



---

# Knowledge Generation II

- Ottawa
  - Strengths
    - Private R&D capabilities – Nortel IBM Ottawa CAS
    - Strong public R&D presence – NRC, University of Ottawa, Carleton University, CITO, CANARIE
    - Strong history of commercialization through firm creation – 60 firms can be traced back to the NRC
  - Weaknesses
    - Collaboration between firms and local universities has been relatively weaker until recently
- Waterloo
  - Strengths
    - Strong public R&D capabilities (U of W, Perimeter Institute)
    - Commercialization through the creation of university spin-offs
  - Weaknesses
    - Few persistent knowledge transfer relationships between firms and local research institutes, including U of W
    - Limited ongoing interaction between firm and universities



---

# Institutions of Collaboration I

- GTA
  - Weak social capital
  - Business class is national and continental in orientation
  - Domination by financial services sector
  - ICT cluster is geographically dispersed and socially fragmented
    - Lack of strong associational voice
    - Weak collaborative institutions
  - Toronto cluster study was politically led
    - Little community involvement
  - Lack of 'civic entrepreneurs'



---

# Institutions of Collaboration II

- Ottawa
  - Strength of local institutions of collaboration
  - OCRI – founded in 1983
    - 700 members, \$4.5 million budget
    - Sponsors 120 events annually
    - Absorbed economic development function of the City of Ottawa
    - Dense network of partnerships with federal and provincial agencies
    - Works closely with NRC's Regional Innovation Centre
  - Economic Generators Initiative, 1999-2000
    - The Ottawa Partnership (TOP)
    - 300 individuals participated
    - Formulated 33 specific goals for 7 clusters
    - 'flagship' initiatives to strengthen the whole region
      - SmartGrowth, Talentworks, Starting Startups
    - 10 of 33 goals have achieved tangible results



---

# Institutions of Collaboration III

- Waterloo
  - Close collaboration across region, despite political fragmentation
  - Formation of Canada's Technology Triangle in 1987
    - Joint marketing initiative
    - Led to CTT Accelerator Network to help early stage firms become investment ready
  - Communtech founded in 1997
    - Lead role played by core group of CEO's
    - Currently has 240 members, half in legal and accounting firms
    - Runs array of programs similar to OCRI
      - Peer to peer groups
      - Mentoring
      - Business Accelerator Program (CTTAN)
    - Continuing links with the university





---

# Policy Support for Cluster Development

- Networking Institutions for Collaboration
  - Promote cluster awareness
  - Engage in dialogue of cluster's competitive position
  - Monitor and communicate market and technology trends
  - Develop training and management programs
  - Develop mentoring programs for new firms/business people
  - Participate with government in recruitment efforts
  - Expand cluster to include all constituents
  - Link common assets across clusters
  - Nurture cluster leaders at regional and national level
    - civic entrepreneurs/social animators
    - OCRI in Ottawa, Communtech in KW



---

# Drivers of Cluster Initiative Success

- **Setting**
  - Strong business environment
  - Trust in government
  - Strong regional government
  - Cluster strength
- **Objectives**
  - Broad range of objectives
  - Objectives selected based on cluster's specific needs
  - No significant effect of special objectives
- **Process**
  - CI Facilitator with cluster insight
  - CI has office and significant budget
  - CI has clear strategy and measurable goals
  - No negative effect of government financing
  - Negative effect of limiting participation
    - Source: TCI Greenbook, 2003



---

# Drivers of Cluster Initiative Success

- **Setting**
  - Strong business environment
  - Trust in government
  - Strong regional government
  - Cluster strength
- **Objectives**
  - Broad range of objectives
  - Objectives selected based on cluster's specific needs
  - No significant effect of special objectives
- **Process**
  - CI Facilitator with cluster insight
  - CI has office and significant budget
  - CI has clear strategy and measurable goals
  - No negative effect of government financing
  - Negative effect of limiting participation
    - Source: TCI Greenbook, 2003



---

# Magic Bullets ?

- Business led
  - sustain leadership
  - Identify champions
- Clustering is a process not a goal
- Promote networking and interaction
  - Build common vision
- Focus on achievable steps
  - Revise, refocus
- Align institutions and resources
  - Across three levels of government
  - Clusters focus federal/provincial initiatives
  - Clusters lead workforce development
  - Educational institutions target critical areas

