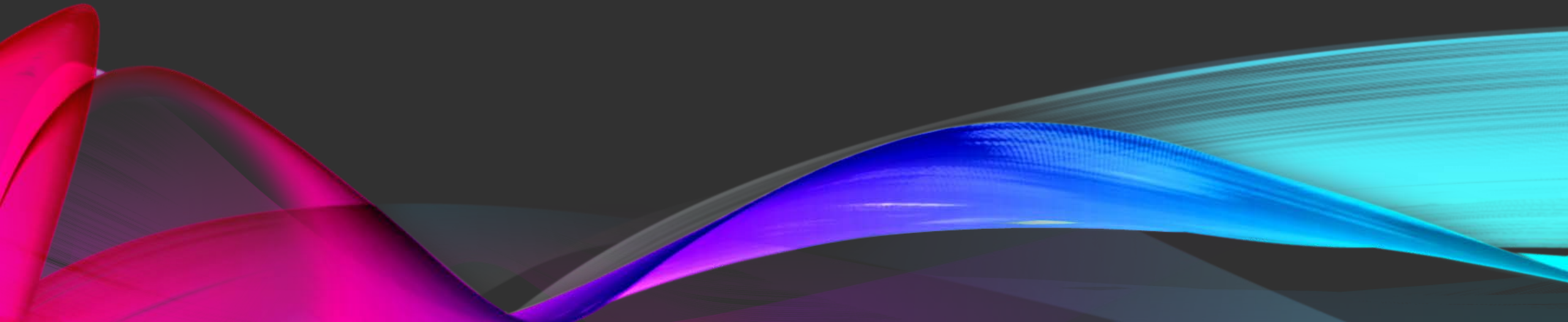


# INNOVATION-LED ECONOMIC DEVELOPMENT IN HOWARD COUNTY

*Using Cluster Analysis, Network Analysis and Spatial Analysis to Identify  
Economic Development Strategies*



# OUTLINE

- Introduction
- Traditional Economic Analysis Methods
- Spatial Analysis
- Network Analysis
- Company and Cluster Profiles
- Recommendations & Conclusion





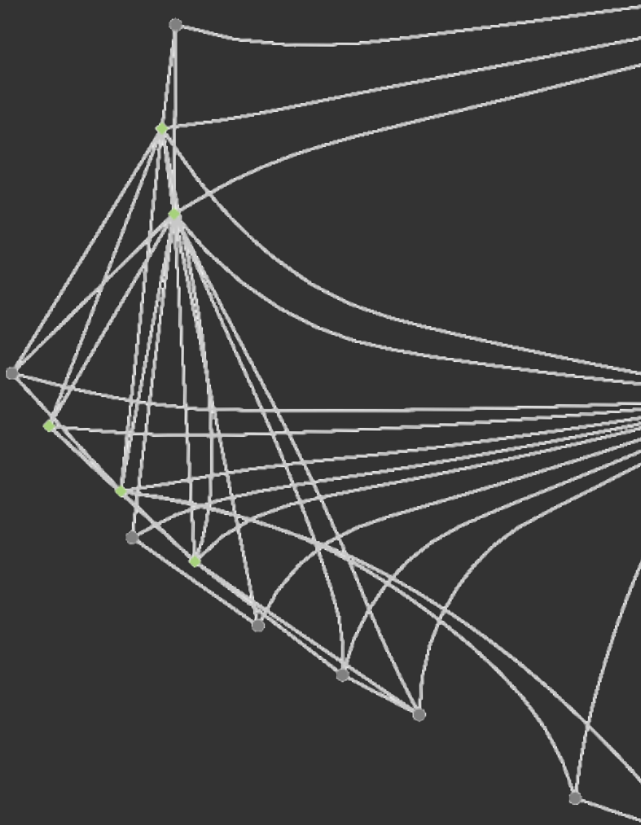
# INTRODUCTION

# RESEARCH QUESTION

*How do we spur innovation-led economic growth in Howard County?*

## Goals

- 1) Analyze the innovation and entrepreneurial ecosystem in Howard County using multiple methods
- 2) Identify potential Innovation Led Economic Development opportunities based on the analyses
- 3) Develop detailed actionable ILED strategies around the opportunities identified







# MULTIPLE METHODS

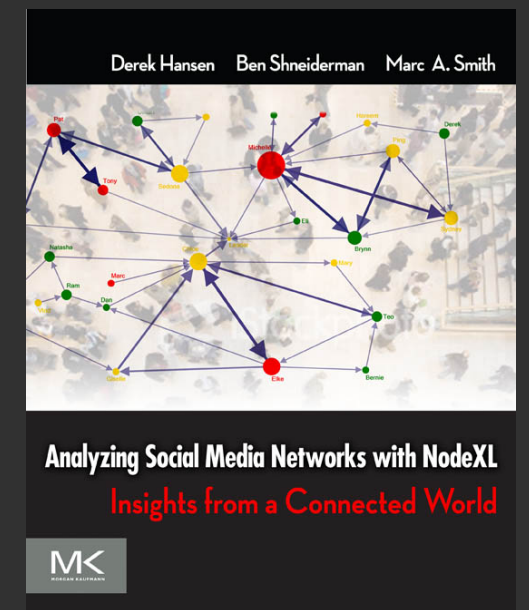
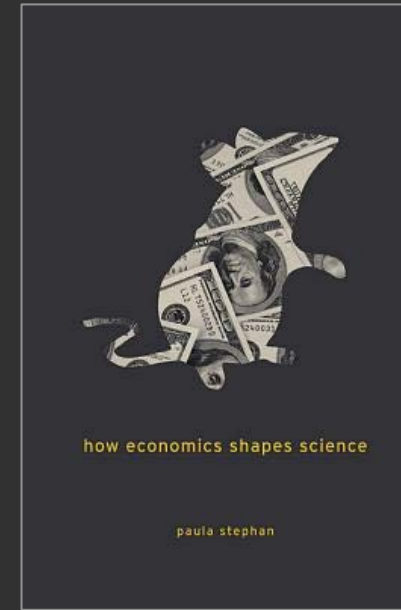
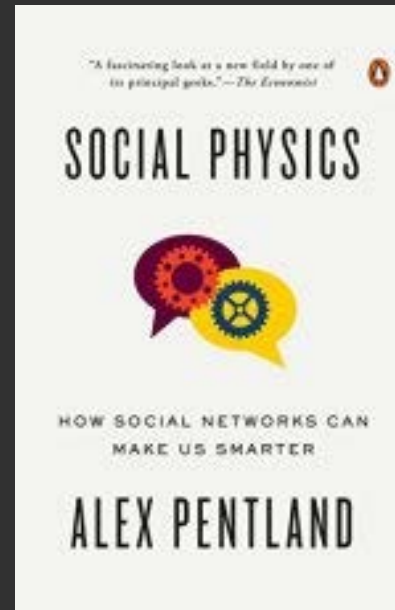
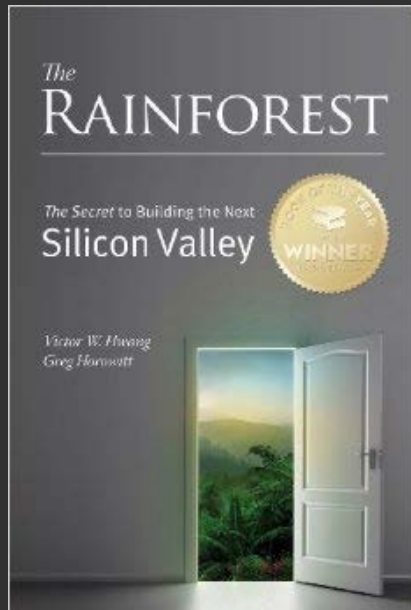
Demographic  
Analysis

Cluster Analysis

Spatial Analysis

Network Analysis

# INNOVATION LITERATURE



# NATURE OF INNOVATION

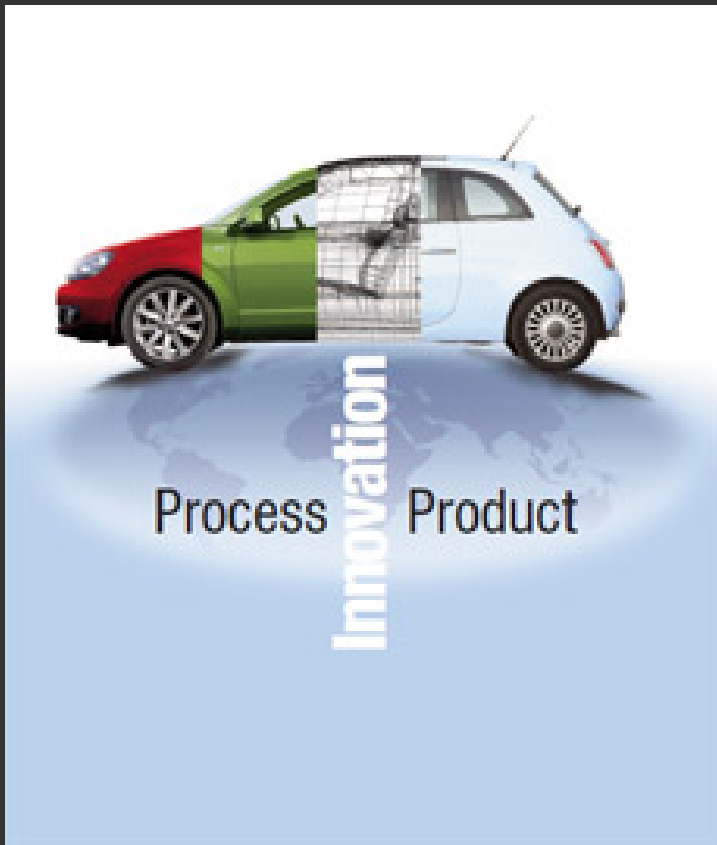
Innovation...



- Creates value
- Is implementable & impactful
- Can change with context

Innovation is the result of:

- Diversity of people, ideas, and expertise
- Trust, connection, communication
- Trial & error
- Capital & investment
- Suitable regulatory environment (few barriers)

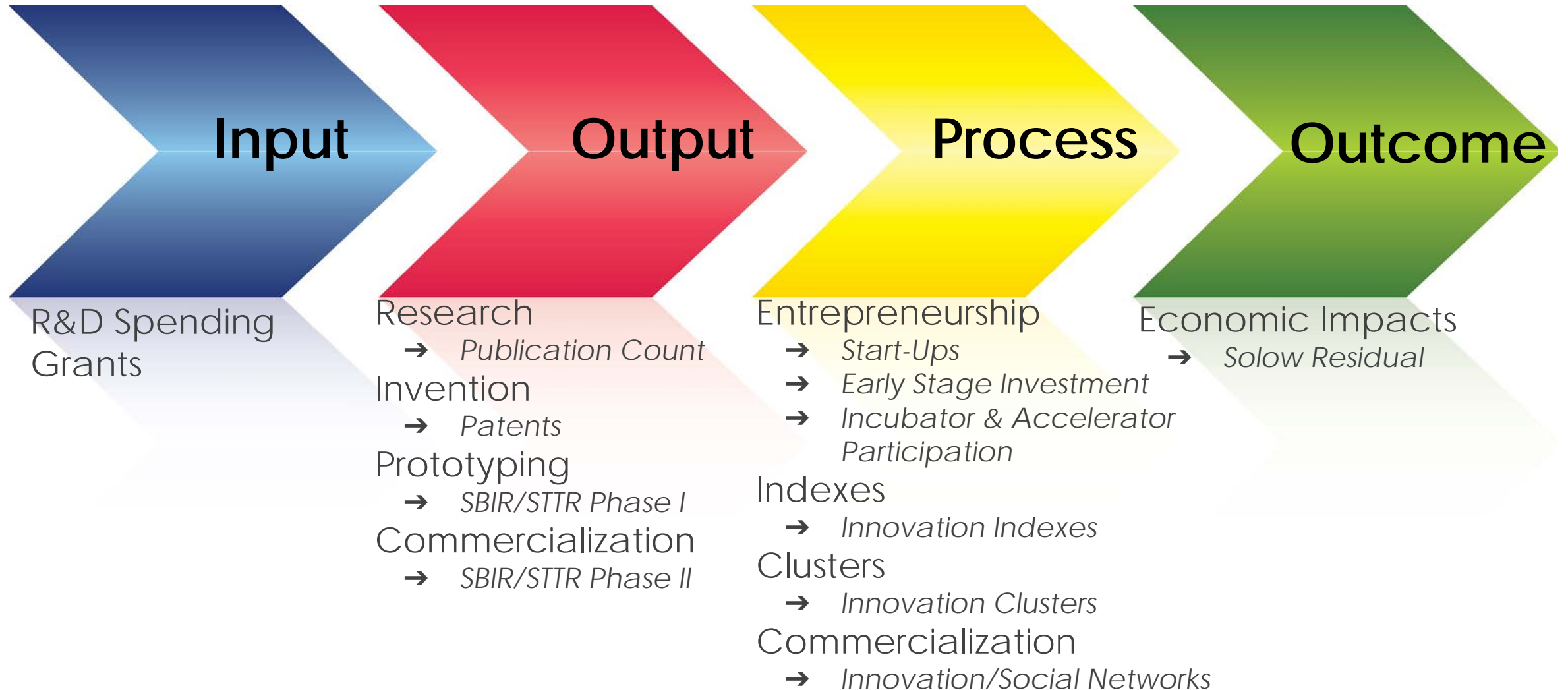


# INNOVATION AS AN ECONOMIC DRIVER

- Innovation alone does not contain \$\$\$
- Innovation often requires economic incentives
- Innovation is not a linear process
- Character of innovation is industry-based and reactive to economic climate

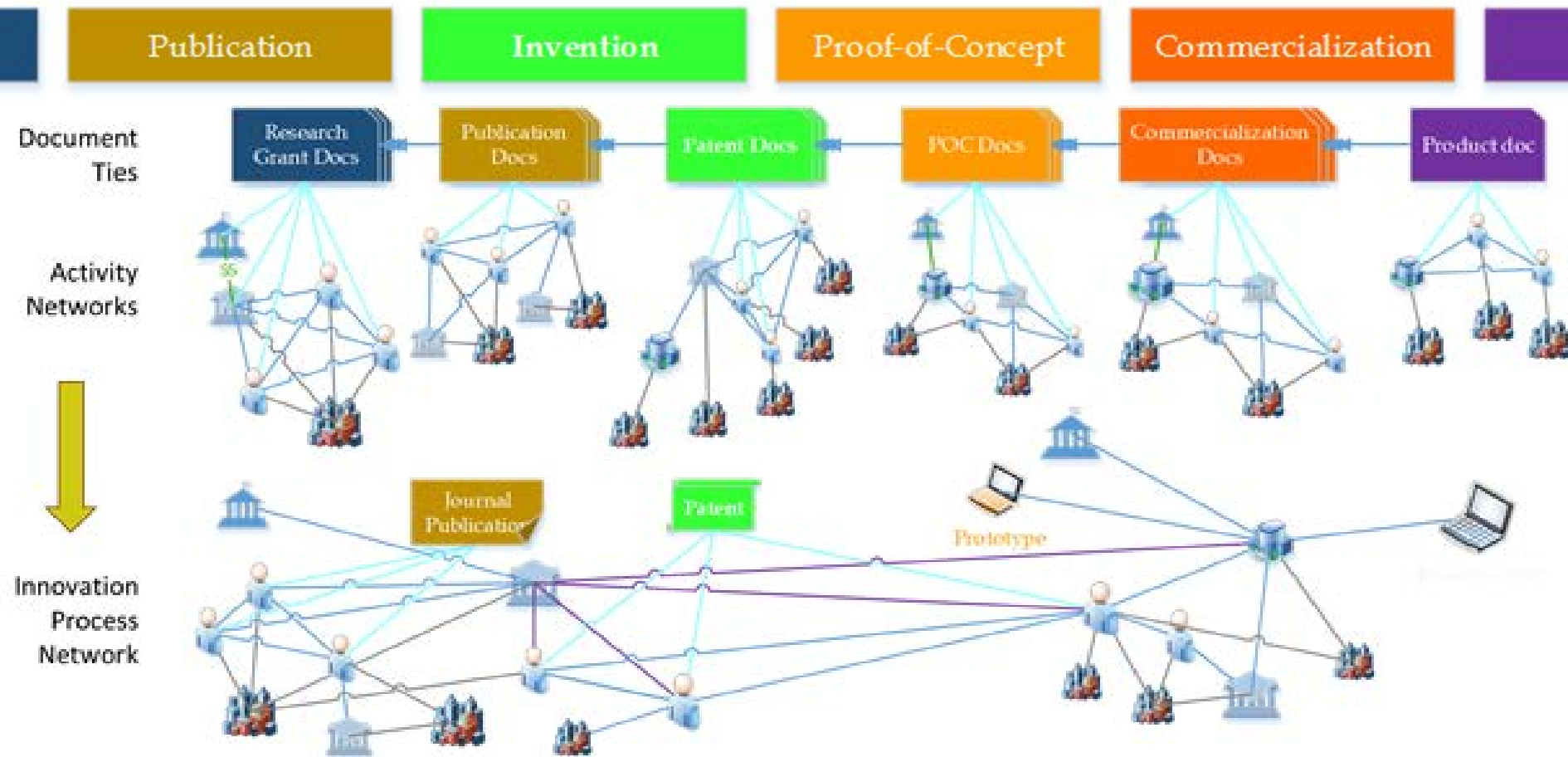


# MEASURING INNOVATION





# NETWORK ANALYSIS OVERVIEW



Combining activity networks yields an innovation process network



# TRADITIONAL ECONOMIC ANALYSIS

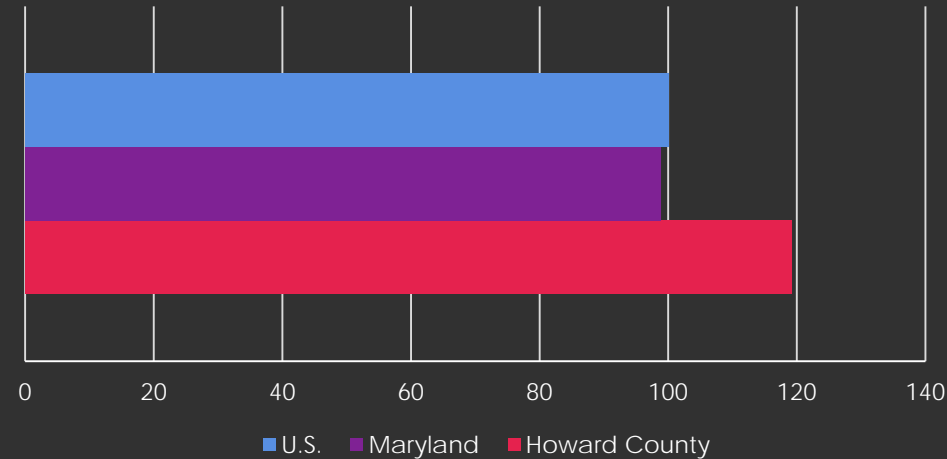
# HOWARD COUNTY PROFILE

## Quick Facts

Total population (2014):	299,269
Median Age:	38.6
Median Household Income:	\$110,133
Number of Business Establishments:	8,946

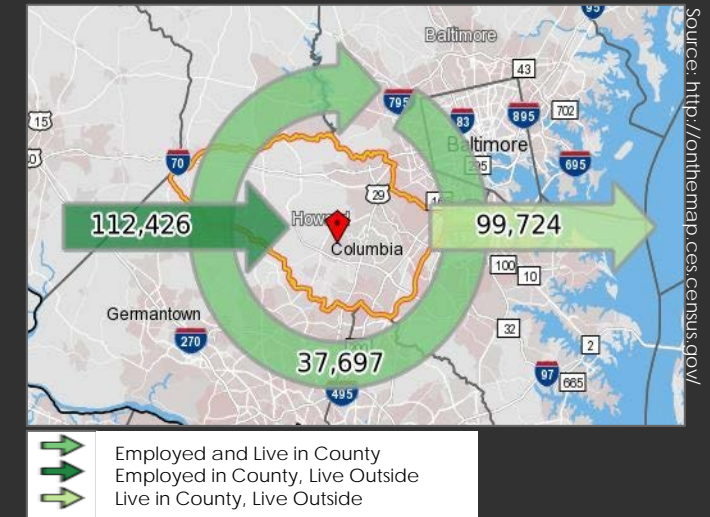
Sources: ACS 2010-2014 ACS estimates, U.S. Census Bureau, 2013 County Business Patterns

## Innovation Index



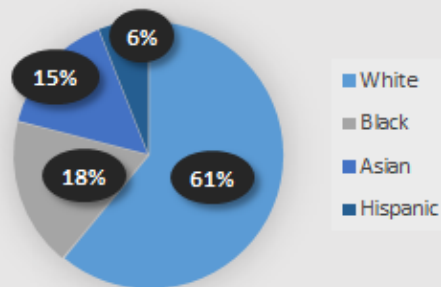
Source: [http://www.statsamerica.org/innovation/innovation\\_index/index\\_display.asp](http://www.statsamerica.org/innovation/innovation_index/index_display.asp)

## Commuting Flows



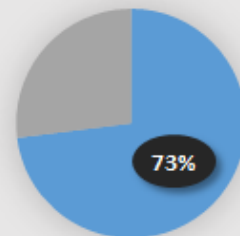
## RACIAL COMPOSITION

Source: ACD 2009-2013 estimates



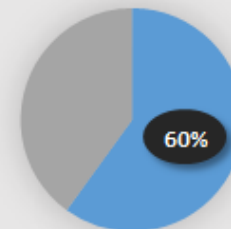
## LABOR FORCE PARTICIPATION RATE

Source: U.S. Census Bureau, 2011-2013



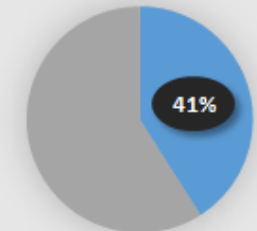
## RESIDENTS WITH BACHELORS DEGREE

Source: U.S. Census Bureau, 2011-2013



## COUNTY JOBS HELD BY RESIDENTS

Source: MD Department of Planning and Maryland DBED, 2009-2013

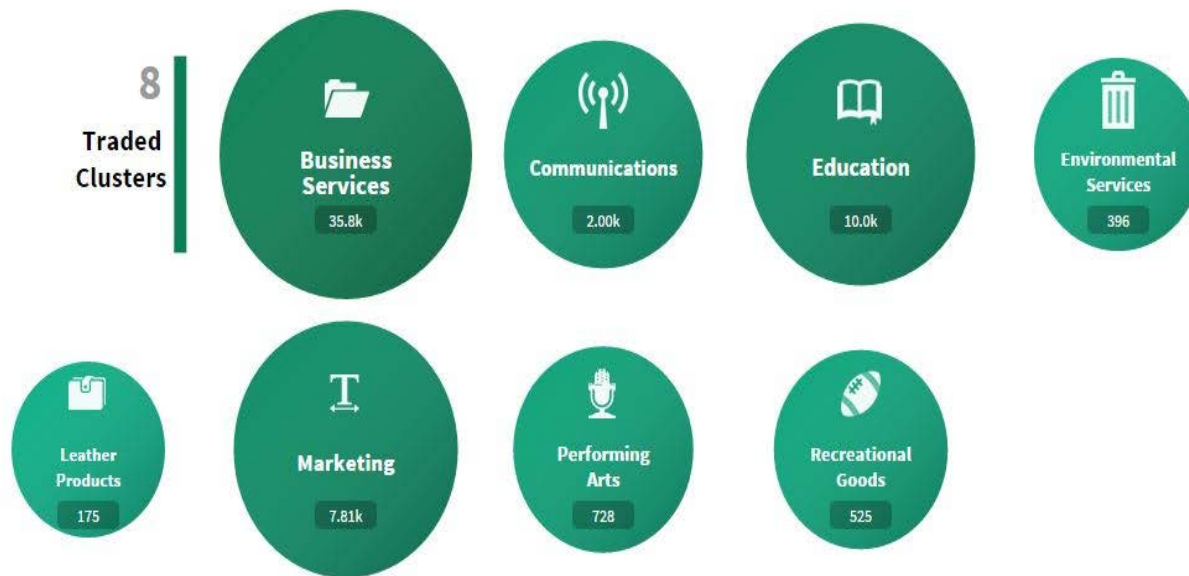




# CLUSTER MAPPING

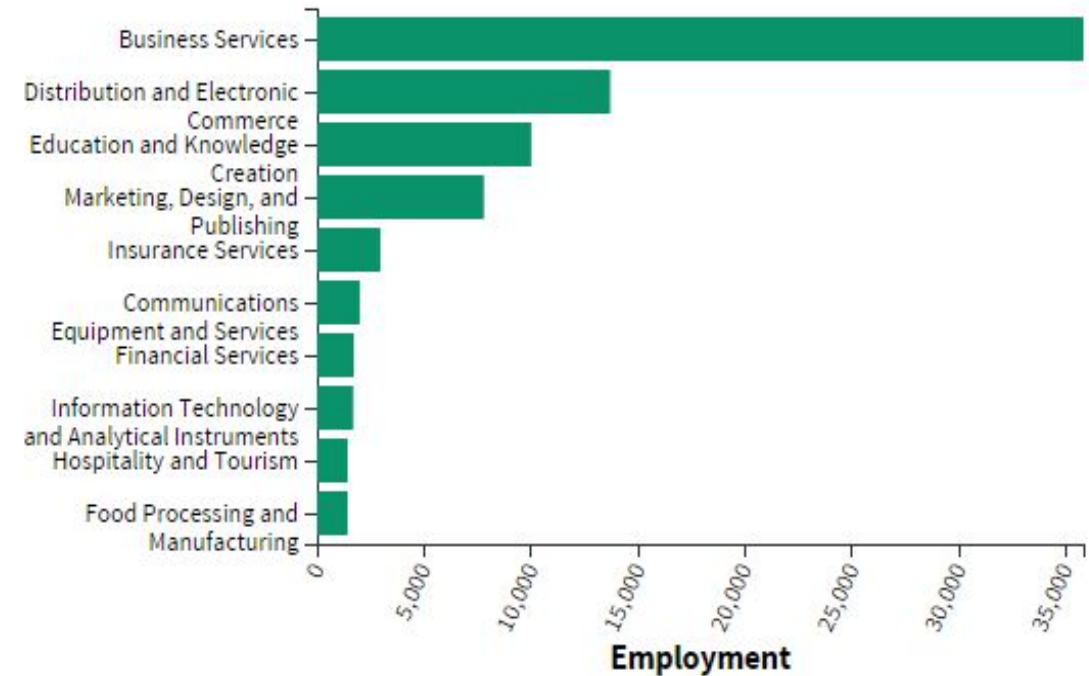
## RESULTS

### Top Clusters by Location Quotient



vs.

### Top Clusters by Employment



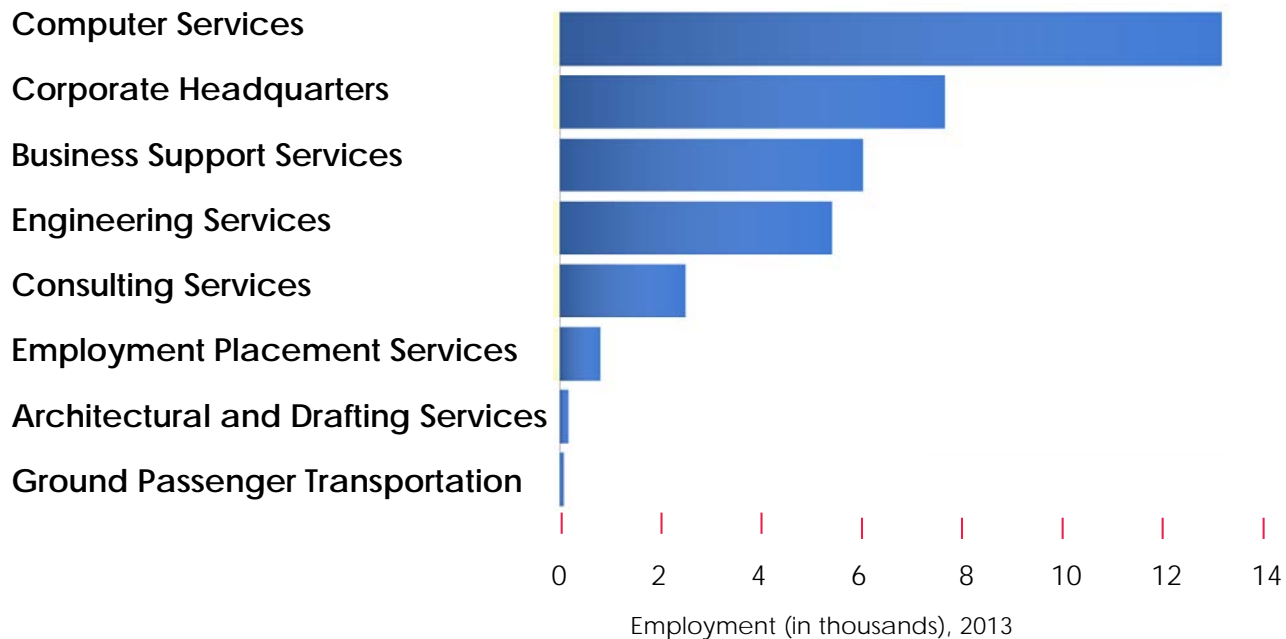


# SUBCLUSTERS

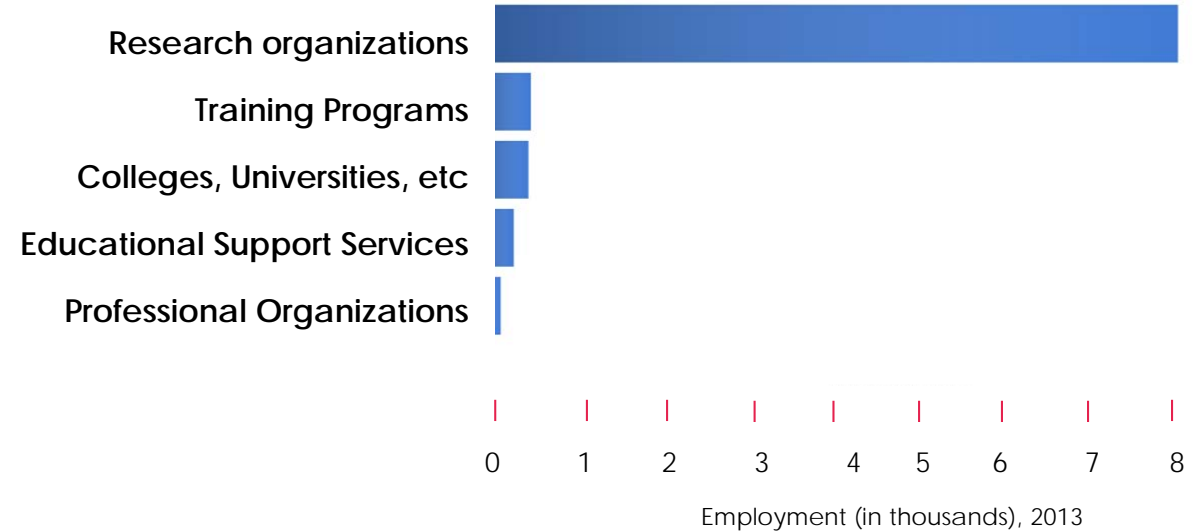
(U.S. Cluster Mapping)

Several clusters are influenced by one or two strong subclusters:

## Business Services



## Education and Knowledge Creation







# CLUSTER ANALYSIS COMPARISON

## StatsAmerica

### Top Industry Clusters by Employment Location Quotient (2012)

Description	Employment	LQ
Info. Tech. & Telecommunications**	20,555	3.37
Defense & Security	22,936	2.62
Business & Financial Services	29,312	2.08
Energy (Fossil & Renewable)*	14,295	1.99
Advanced Materials	9,326	1.81
Computer & Elect. Product Mfg	1,371	1.1

Data Source: [www.statsamerica.org](http://www.statsamerica.org)

## U.S. Cluster Mapping

### Top Traded Clusters by Employment Location Quotient (2013)

Description	Employment	LQ
Marketing, design and publishing	7,805	3.1
Environmental services	396	2.31
Communications equipment and services	2,000	2.16
Recreational and Small Electric Goods	528	1.71
Education and knowledge creation	10,018	1.69
Business Services	35,828	1.64

Data Source: [www.clustermapping.us](http://www.clustermapping.us)

\*Cluster may be a false positive - industry may not have a significant presence in the County.

\*\*Skewed by strong subclusters



# SPATIAL ANALYSIS

# SPATIAL METHODS

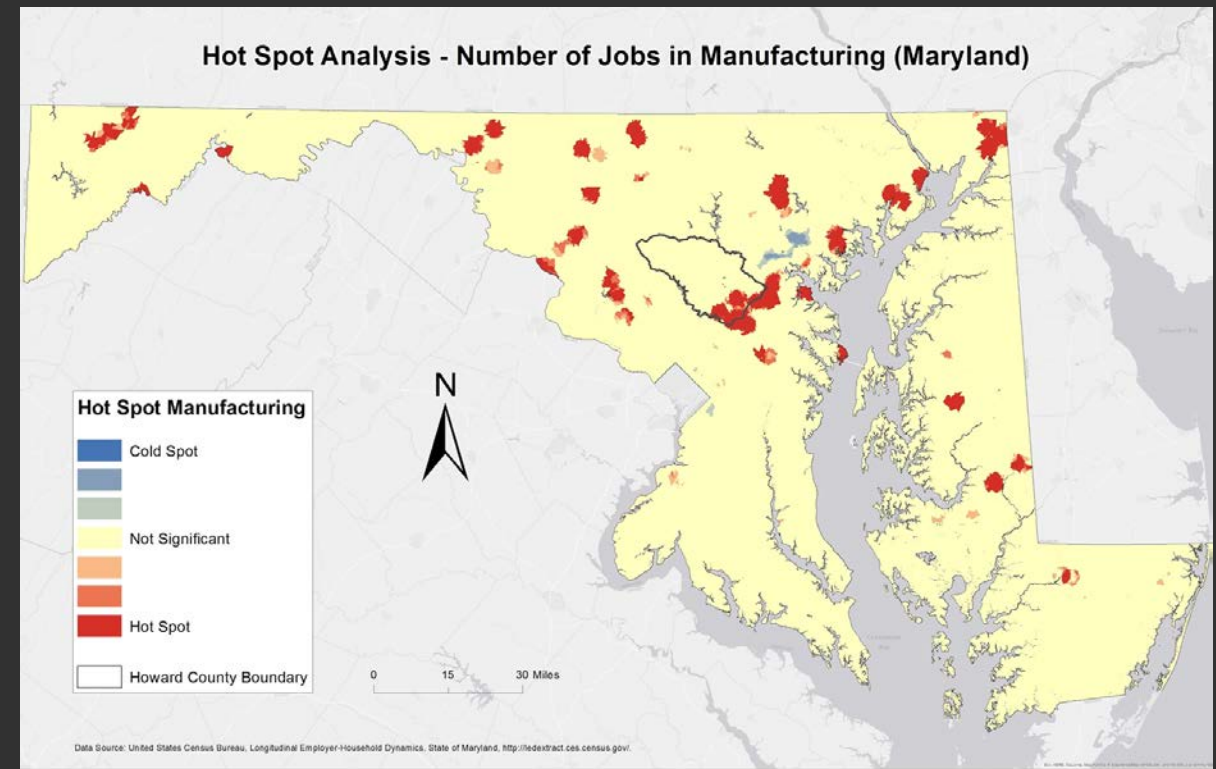
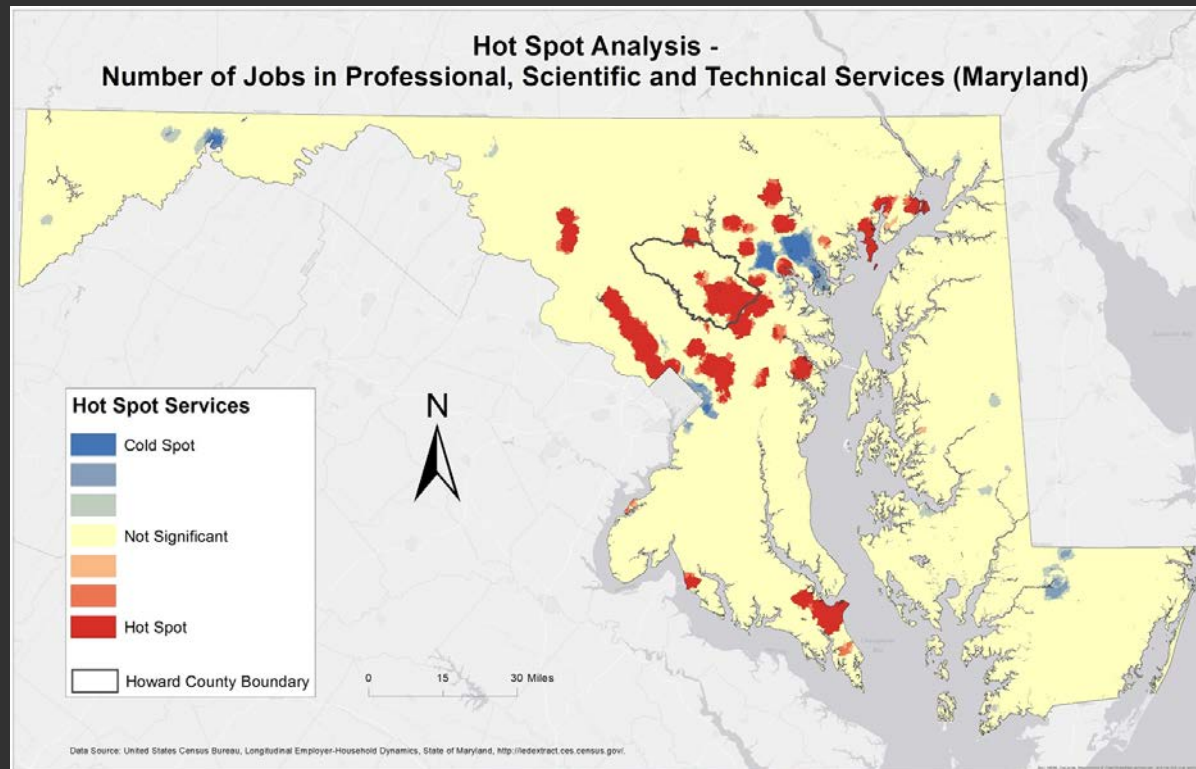
## Background

- Innovation Cluster Mapping and Identification
- Spatial Point Pattern Analysis

## Methodology

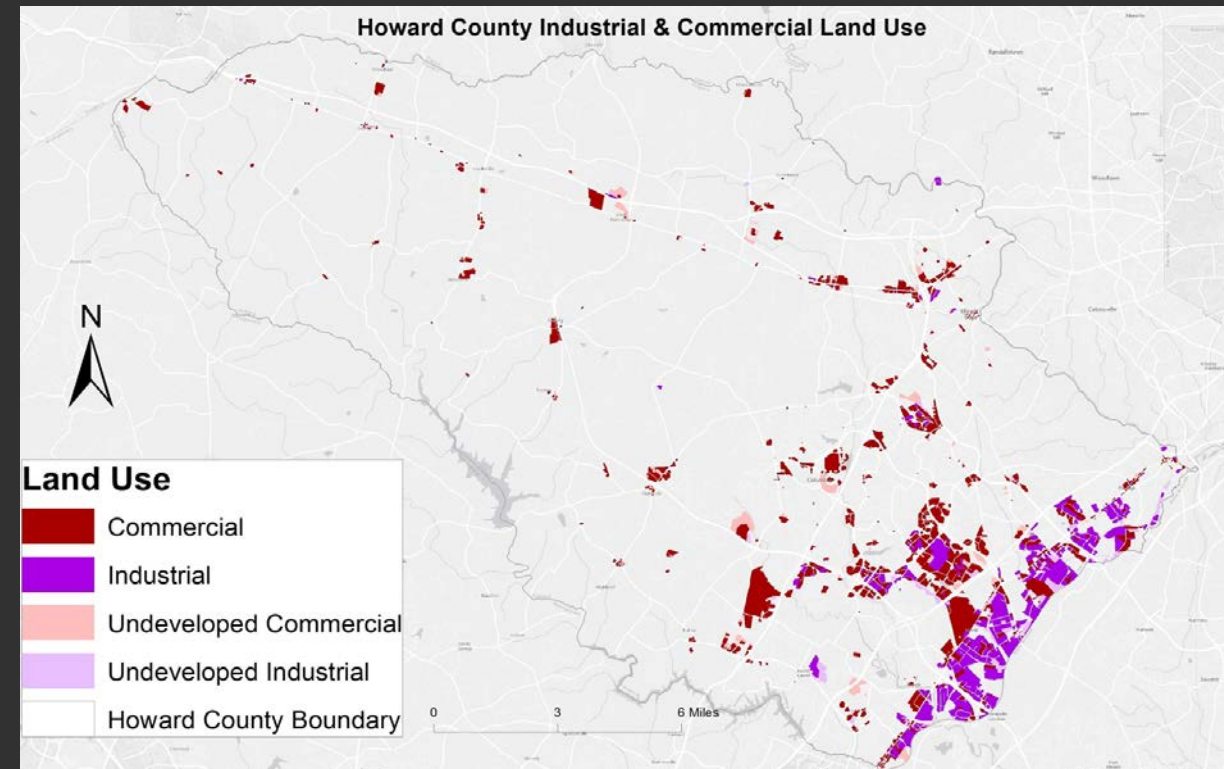
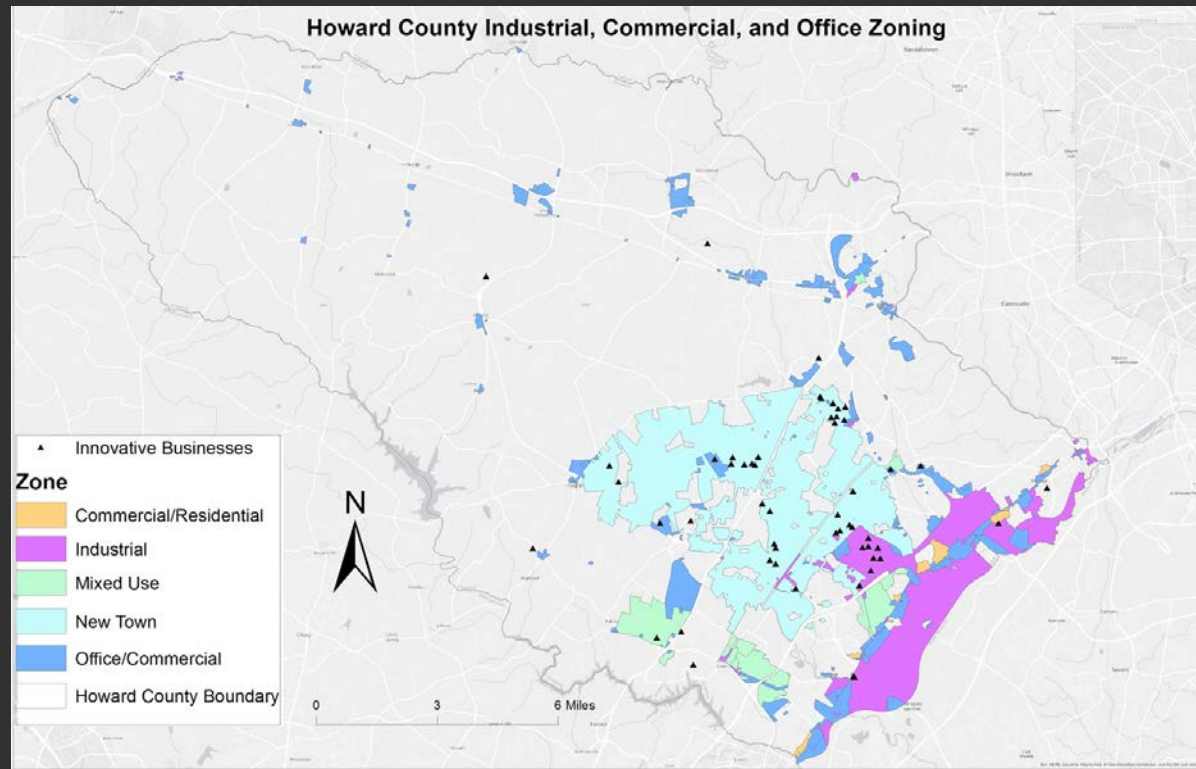
- Identify clusters of innovative firms
- Evaluate locations based on current conditions and company mix
- Select cluster for location based strategy development

# HOT SPOT ANALYSIS BASED ON LONGITUDINAL EMPLOYER-HOUSEHOLD DATA (LEHD)



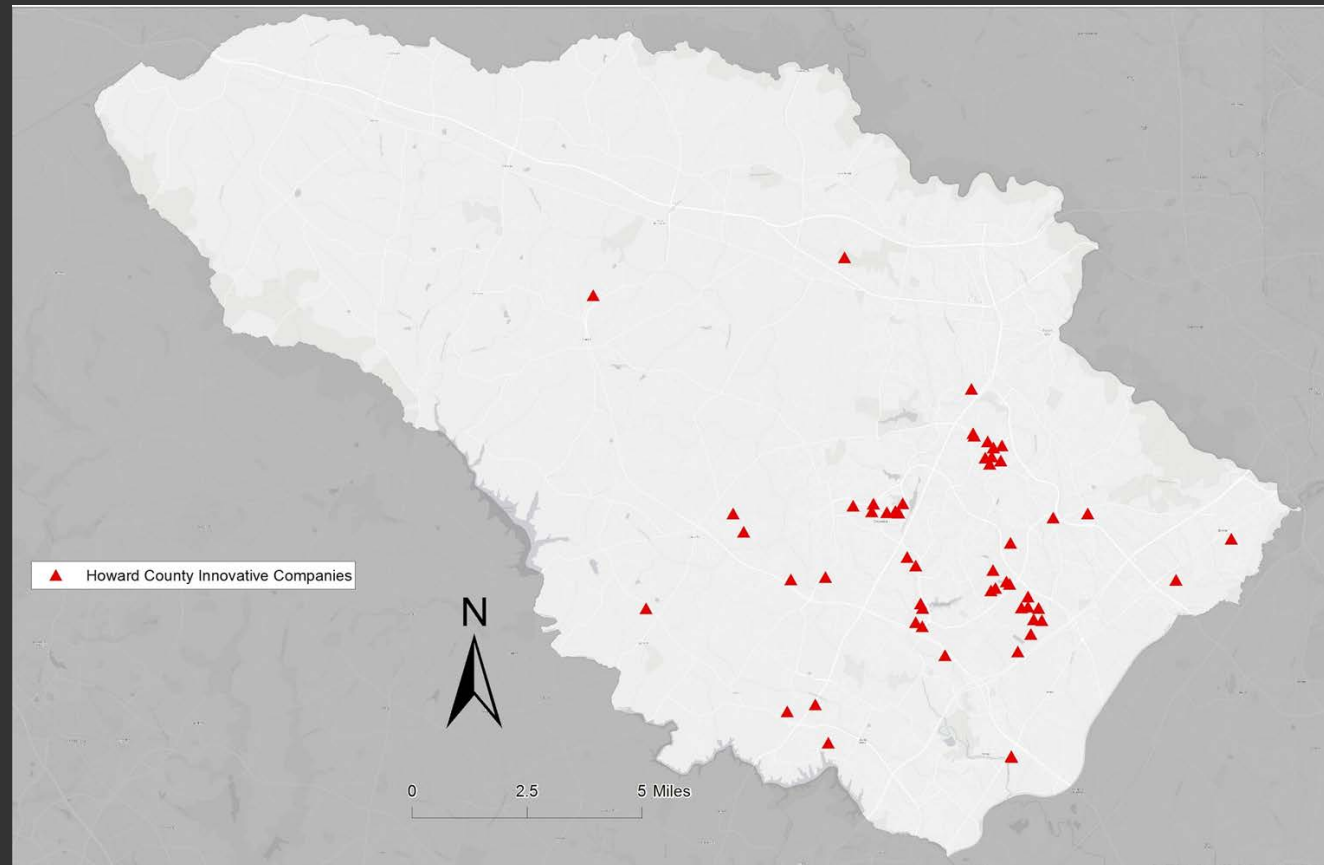


# HOT SPOT ANALYSIS OF INNOVATIVE BUSINESSES

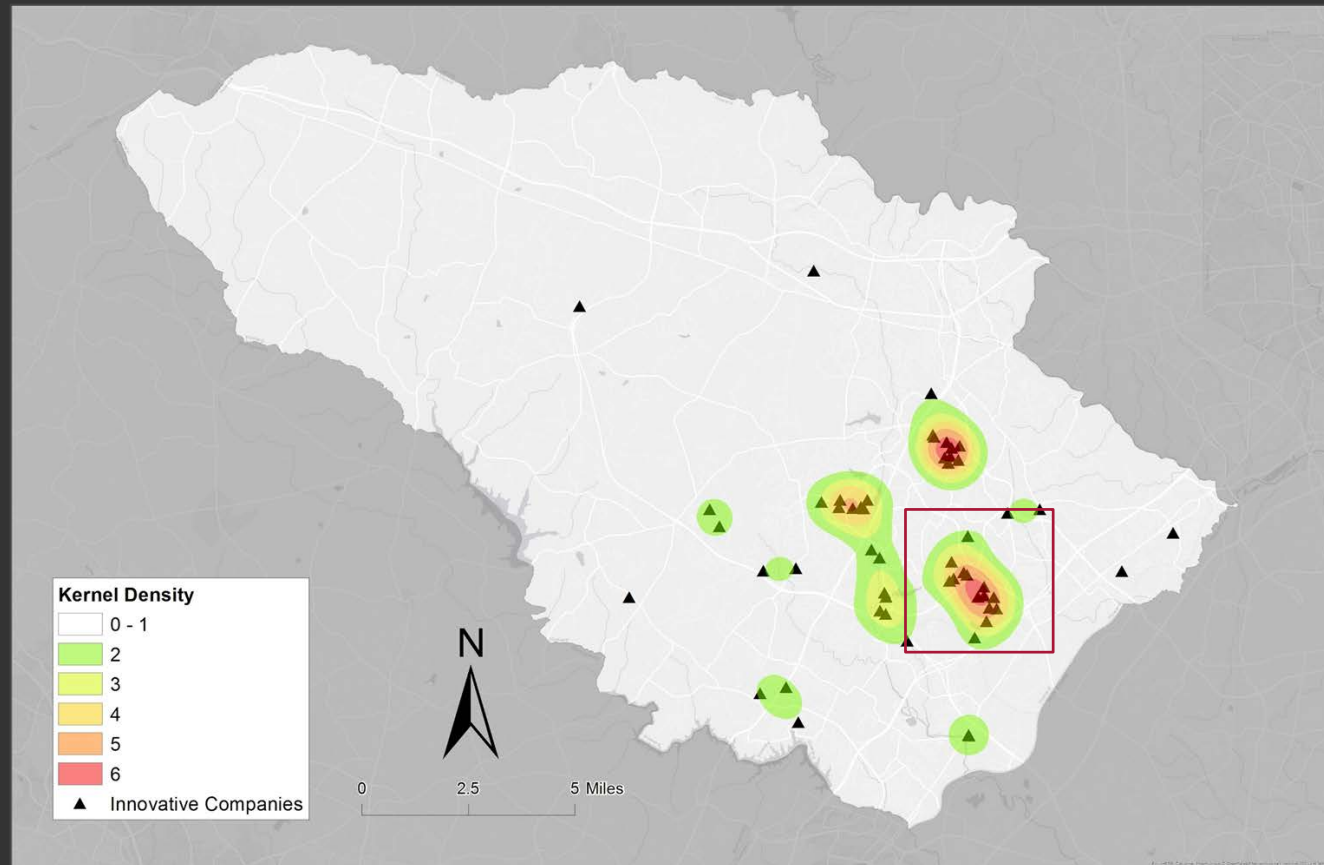




# INNOVATIVE COMPANY LOCATIONS



# KERNEL DENSITY ANALYSIS RESULTS





SULTS



INTRODUCTION

TRADITIONAL METHODS

SPATIAL ANALYSIS

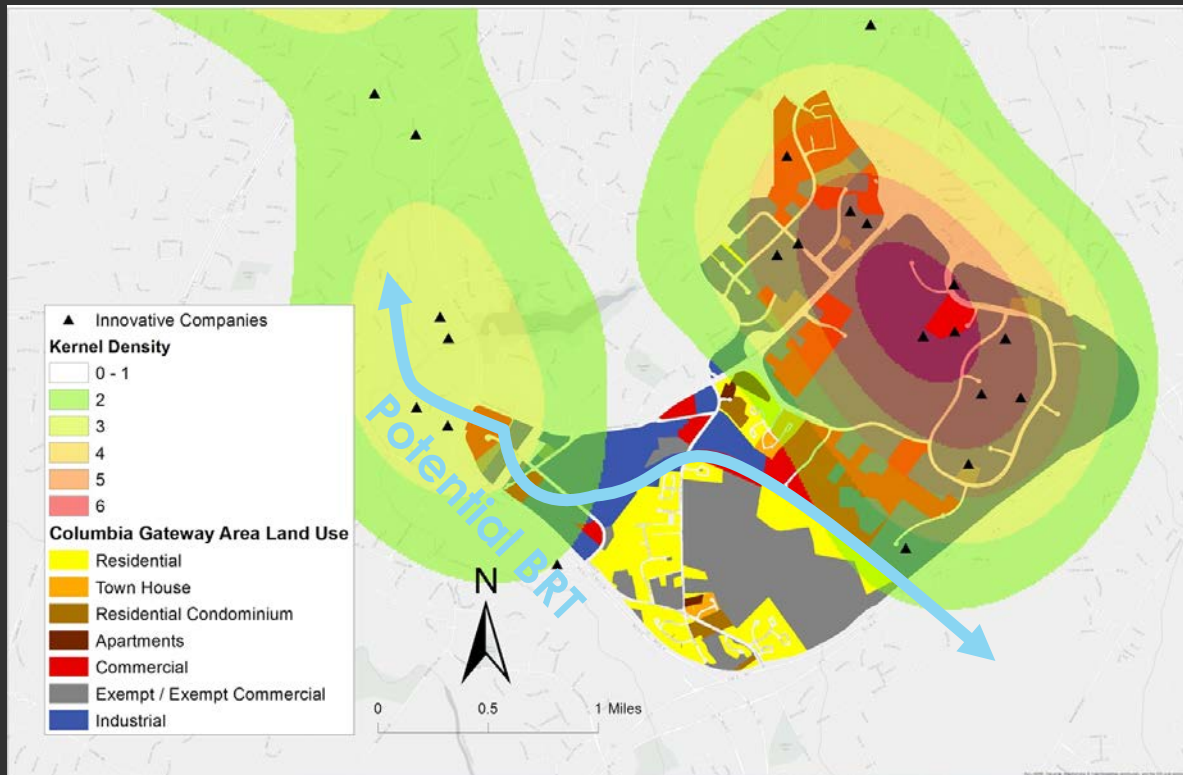
NETWORK ANALYSIS

PROFILES

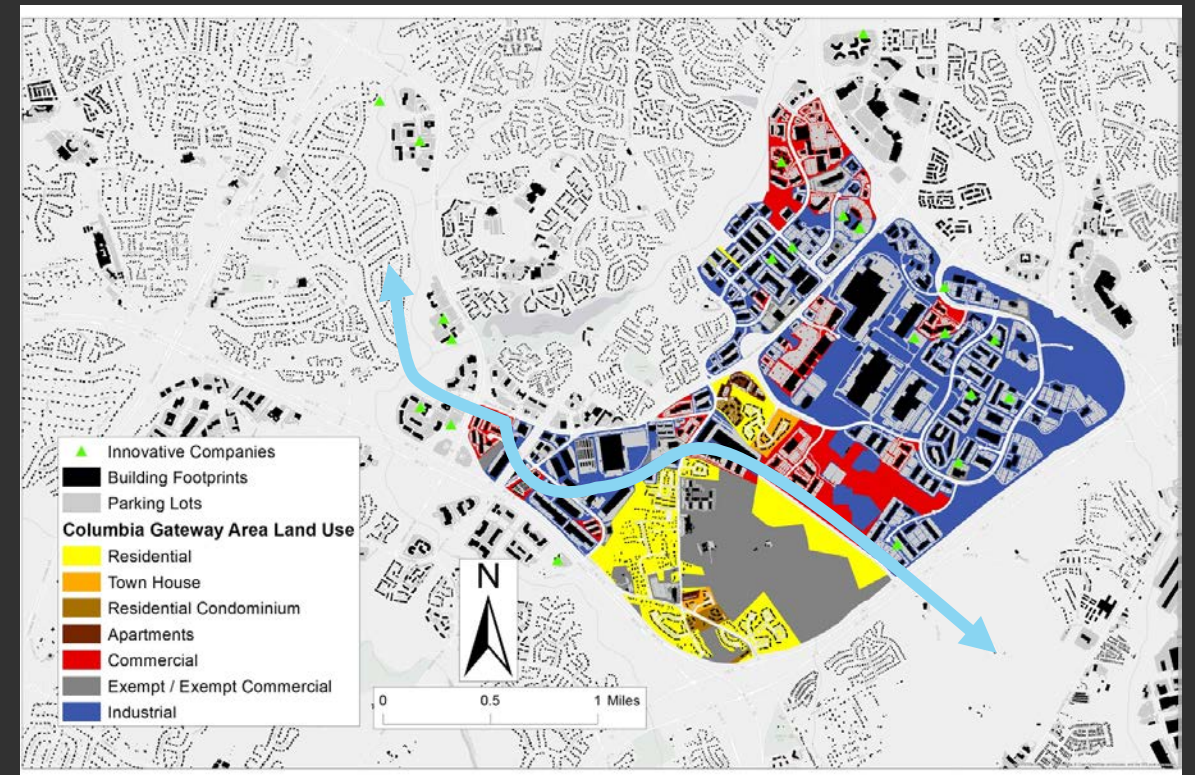
RECOMMENDATIONS



# COLUMBIA GATEWAY INNOVATION DISTRICT: EXISTING CONDITIONS



Innovation District Land Use and Kernel Density



Innovation District Building Footprints and Parking

# COLUMBIA GATEWAY INNOVATION DISTRICT PROPERTIES

Company	Property Owner	Land Value	Assessed Value	Acres	2015 Property Tax
Science & Engineering Services Inc	AAK LLC	\$7,187,400	\$13,509,133	15	\$202,048
Universities Space Research	Universities Space Research	\$4,039,300	\$10,779,867	8.43	\$101,223
Masstech	GATEWAY CROSSING 95 LLC	\$3,938,600	\$6,357,500	8.22	\$95,663
ACELL	6711 GATEWAY LLC	\$3,061,800	\$14,733,333	6.39	\$208,669
Advanced Technology & Research Corp	GATEWAY A 74 & A 76 LLC	\$22,650,100	\$42,000,000	115.55	\$667,125
Envieta LLC	MOR GATE LLC	\$5,122,200	\$13,382,000	10.69	\$194,804
Osiris Therapeutics	EM CORP UNIVERSITY OF MD MEDICAL	\$2,467,600	\$7,417,400	5.15	\$10,979
Agnik LLC	MERRITT-CCP II LLC	\$2,607,000	\$11,685,067	6.65	\$167,885
Martek Biosciences Corp.- (acquired by DSM)	COLUMBIA BUSINESS CENTER GREEN LLC	\$844,100	\$4,021,300	3.23	\$59,344.70
Raba Equity Partners LLC	MERRITT CCP III LLC	\$3,014,700	\$19,317,200	7.69	\$275,305.93
Ibiquity Digital Corp.	MERRITT CCP V LLC	\$2,211,100	\$14,955,067	5.64	\$212,784.35
Bowles Fluidics Corp.	BROADSTONE BFC MARYLAND LLC	\$1,633,500	\$5,291,167	6.25	\$79,123.92
Next Century Corp.	AAK II LLC MARYLAND LLC	\$9,516,100	\$21,492,633	19.86	\$317,872.89

INTRODUCTION

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SPATIAL ANALYSIS

NETWORK ANALYSIS

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RECOMMENDATIONS



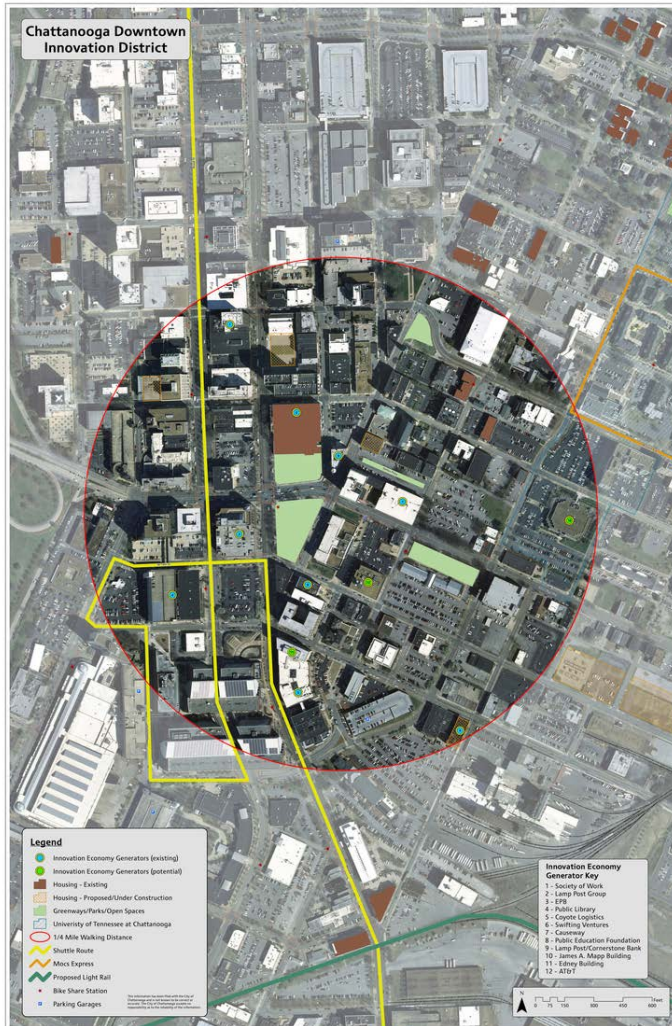
# SPATIAL ANALYSIS RECOMMENDATIONS

- Walkable innovation district at the Columbia Gateway area located south of Snowden River Parkway, west of 175, north of interstate 95 and east of route 32
- Laboratory space for Regenerative Medicine companies
- Warehouse space for startups





# EXAMPLES ACROSS THE U.S.



Content Grow Events TV More

## For Entrepreneurs By Entrepreneurs

Here at Hatch, we believe in people having the ability to build a path to the future they want. So, we've built an ecosystem for entrepreneurs to thrive by creating events, programs, workshops, and courses designed to help people and their companies to flourish.

### What stage are you in?

No matter where you are in the startup lifecycle, Hatch can help. We know everything it takes to get you from the very early stages, to making your first sale, hiring your first employees, receiving press, and achieving all of your entrepreneurial dreams.



#### Idea or Napkin Stage

How do I turn my idea into a company?

I have an awesome hobby, but how do I make money of it?

I don't even know where to start, what do I need to do to start a company?



#### Launch Your Company

I just launched my company, now what?

What are some marketing tips for a startup?

How do I tell people about my startup?



#### Grow Your Business

I want to expand, what do I do?

My startup is growing, but I want more customers.

How do I take my startup to the next level?

INTRODUCTION

TRADITIONAL METHODS

SPATIAL ANALYSIS

NETWORK ANALYSIS

PROFILES

RECOMMENDATIONS

# NETWORK ANALYSIS

The background features a dark grey, almost black, field. Overlaid on this are several fluid, wavy bands of color. A prominent magenta band curves from the top left towards the center. Another band, transitioning from deep blue to a bright cyan, flows from the bottom right towards the center. These bands have a soft, ethereal quality, with some internal texture visible, suggesting a liquid or smoke-like movement.



# HOWARD COUNTY FULL INNOVATION NETWORK

## Keystones

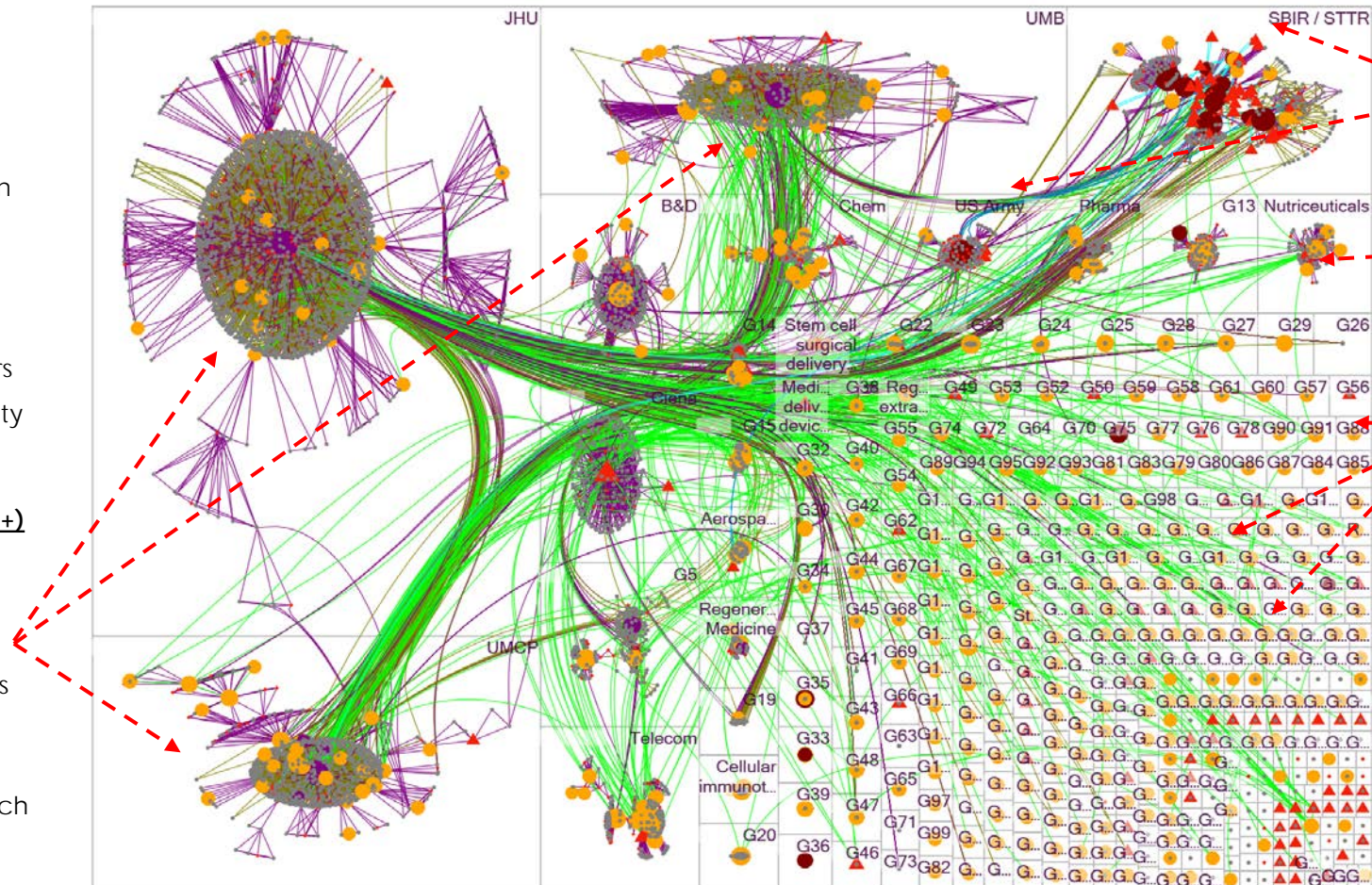
- Identify & cultivate keystones in each innovation cluster
- Identify & cultivate capital networks around each innovation cluster

## Workforce Development

- Develop industry partnerships (EARN) around innovation clusters
- Work with universities & community colleges on talent pipeline

## Universities (JHU, UMCP, UMB, UMBC+)

- Leads for licensing & research
- Identify key labs for expansion / enhancement
- Identify potential faculty spin outs
- Accelerate student startups & seed them in clusters
- Build long-term sponsored research relationships



## Business Expansion & Expansion (BRE)

- Focus BRE on growth stage & mature companies
- Develop keystones

## Foreign Direct Investment (FDI)

- Engage MD DOC on FDI
- Engage foreign-owned companies & expand FDI

## Business Attraction Opportunities

- Focus on early stage companies with County connection
- Develop relationships with growth stage companies;
- Make their next move to Howard County
- Connections to capital

## Accelerate Entrepreneurship

- Support local startups
- Assist with market development
- Connect to capital & cluster firms

Created with NodeXL (<http://nodexl.codeplex.com>)



# REGENERATIVE MEDICINE NETWORK CLUSTER

## Regenerative Medicine & Nutraceuticals groups

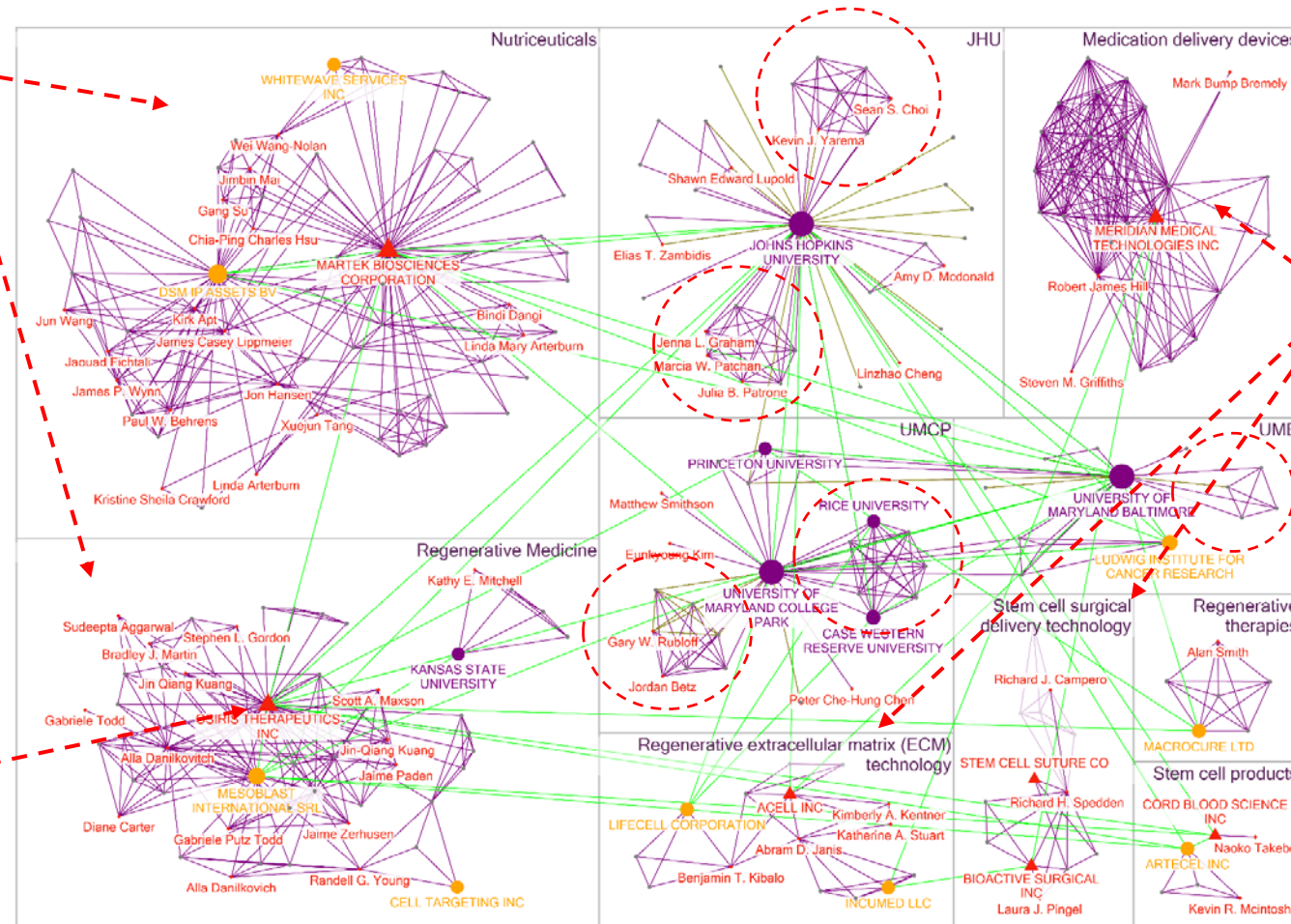
- Develop 'keystone companies'
- Promote local sourcing to help build cluster around keystones
- Industry partnerships for workforce dev
- FDI / Business expansion
- Business attraction / supply chain development
- Corporate sponsored research relations with universities

## University groups (JHU, UMCP, UMB)

- Follow-up leads for licensing (green ties)
- Identify key labs (dense subgroups) and evaluate for expansion / enhancement
- Identify opportunities for faculty spin outs
- Identify / accelerate potential student startups that can be seeded in this cluster
- Build long-term corporate sponsored research relationships with keystone companies

## Drill-down to Company Profiles

- Click to follow link



## Targeted Economic Development Strategies At the Cluster Level

### Delivery devices groups, ECM group

- Facilitate collaboration
- For ECM - assist with niche market development around wound care
- Business attraction

### Stem cell products group

- Commercialization, acceleration, entrepreneurial support
- Business attraction
- Assistance with market development & positioning

Created with NodeXL (http://nodexl.codeplex.com)

# REGENERATIVE MEDICINE NETWORK

## Regenerative Medicine & Nutraceuticals groups

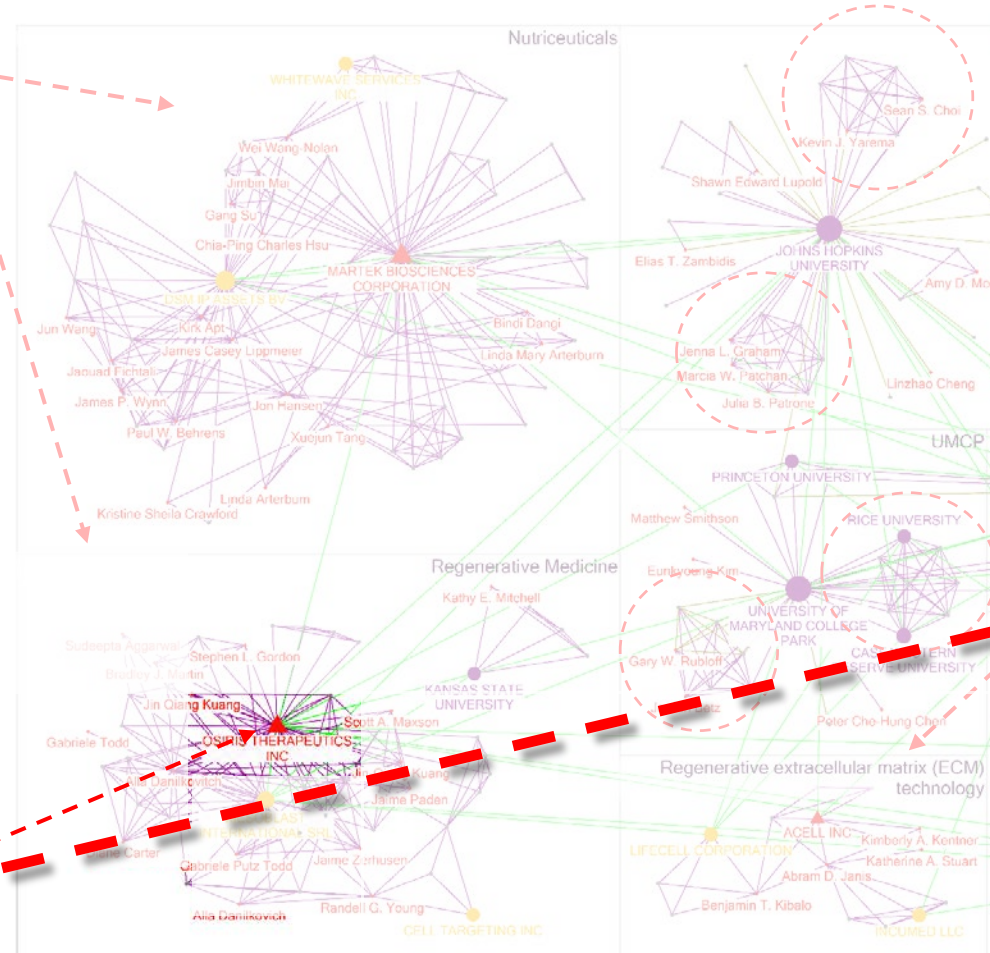
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## Drill-down to Company Profiles

- Click to follow link



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X
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-
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X

←
→
↺
file:///C:/Users/Scott/E
☆
★
≡
...

☆ Academia ☆ Demy ☆ Facebook ☆ Twitter ☆ USAA

### Quick Facts

**Year Founded:** 1992

**Company Type:** Public<sup>1</sup>

**Employees:** 201-500<sup>3</sup>

**Annual Sales:** \$24.3M<sup>1</sup>  
(3rd Qtr 2015)

**Number of Establishments:**

**Key People:** Lode Debrabandere, PhD, President and CEO; Alla Danilkovitch, PhD, Chief Scientific Officer; Jon Hopper, FRCSed., Chief Medical Officer, Frank D. Caworka, Jr. Vice President and General Manager of Wound Care

### Overview

Osiris Therapeutics, Inc., based in Columbia, Maryland, is a leader in researching, developing and marketing cellular regenerative medicine products that improve the health and lives of patients and lower overall healthcare costs.<sup>1</sup>

### Product + Markets

The company continues to advance its research and development in biotechnology by focusing on innovation in regenerative medicine—including bioengineering, stem cell research and viable tissue based products.<sup>1</sup>

### Prospects

We are the first company to receive marketing approval of a stem cell drug and strive to become the world's leading provider of cellular regenerative medicine and novel tissue therapies. The three pillars of our business strategy are to continue our history of innovation, bring about transformation, and to ensure differentiation of our company.<sup>1</sup>

### Additional Info

Strategic Partnerships: Arthrex, Inc., Stryker Corp., and Mesoblast Limited

### Award Summary

3 SBIR Phase 1 (\$270,139)<sup>1</sup>

1 SBIR Phase 2 (\$749,999)

2015 Albert Einstein Drive, Columbia, MD, 21046, (443) 545-1800, <http://www.osiris.com/>

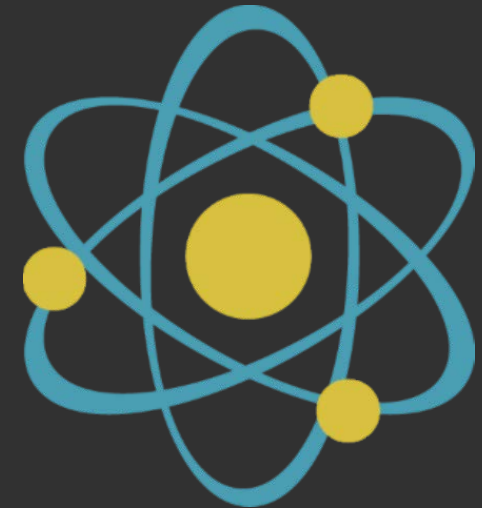
Source: 1—<http://www.osiris.com/> 2—[www.sbr.gov](http://www.sbr.gov) 3—[ledeia.com](http://ledeia.com)



# NETWORK ANALYSIS RECOMMENDATION

## Focus on Regenerative Medicine Cluster

- Regenerative Medicine & Nutraceuticals Group
  - Develop 'keystone companies'
  - Promote local sourcing
  - Industry partnership for workforce development
  - FDI/ Business Expansion
  - Business attraction and supply chain development
- University Group
- Company Profiles
- Delivery Device Group
- Stem Cell Products Group





# COMPANY & CLUSTER PROFILES



# HOWARD COUNTY COMPANY PROFILES

**Advanced Technology and Research**



**Quick Facts**

**Year Founded:** 1973 (as Maryland C-Corporation)

**Company Type:** Private, for-profit

**Employees:** 100

**Annual Sales:** \$10-20 million (estimated)<sup>4</sup>

**Number of Establishments:** 2

**Key People:** Founder and CEO Dr. Jackson Yang

**Overview**

Advanced Technology and Research Corporation (ATR) supplies engineering products and services to the public and private sector. It is comprised of three divisions: Engineering and Systems, Automated Systems and Machines, and Robotics and Control Systems.<sup>1</sup>

**Product + Markets**

Specialties include weapons system development and testing, technologies for ship-to-ship vehicle and cargo transfers, and Unmanned Aerial Vehicle (UAV) recovery, and Unmanned Underwater Vehicle (UUV) recovery. Customers include the defense, postal, and industrial sectors.

**Prospects**

ATR is expanding into the energy sector and recently received awards from the Maryland Energy Administration and Department of Energy to support deployment of its Single Panel Tractor (SPT) solar generation systems. Dr. Yang was named Maryland clean energy entrepreneur of the year in 2011.<sup>2</sup>

**Additional Info**

ATR's 26,000 square foot headquarters in Columbia includes a manufacturing & prototyping facility.<sup>3</sup>



**Award Summary**

2B SBIR Phase 1 (\$2,055,153)  
6 SBIR Phase 2 (\$5,684,710)  
1 STTR Phase 1 (\$60,041)  
1 STTR Phase 2 (\$454,601).<sup>2</sup>  
Multiple U.S. patents<sup>1</sup>

1620161 Anthony drive, Ste 400, Columbia, MD, 21046, (410) 726-1000, www.atrcorp.com

Sources: 1—www.atrcorp.com; 2—www.ahr.gov; 3—www.ahstatedata.com; 4—www.merits.com

LRSP 708      FALL 2015      DEPARTMENT OF URBAN STUDIES & PLANNING      UNIVERSITY OF MARYLAND, COLLEGE PARK

- Over 60 individual companies identified
- Criteria include presence in and/or identifiable ties to Howard County
- Individual profiles for each company including information on size, location, activities, customers, innovation activity and key people
- Assigned to 1 of 5 color-coded cluster categories (based on NodeXL results)

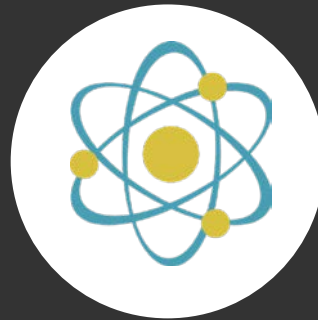
# TECHNOLOGY PROFILES



Research &  
Development



Nutraceuticals



Regenerative  
Medicine



Defense/Intelligence/  
Security

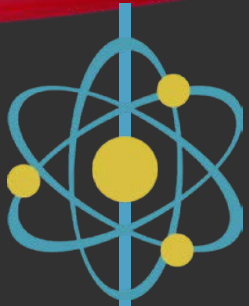


Telecommunications

# COMPARING TECHNOLOGY & INDUSTRY CLUSTERS

Industry Cluster (StatsAmerica)	LQ	Employment	Corresponding Technology Cluster
Information Technology & Telecommunications	3.37	20,555	Telecommunications
Defense & Security	2.62	22,936	Defense/Intelligence/Security
Biomedical/biochemical (Life Sciences)	0.90	15,732	Regenerative Medicine, Nutraceuticals
Business and Financial Services	2.08	29,312	Research & Development
Advanced Materials	1.81	9,326	

# REGENERATIVE MEDICINE



Regenerative medicine is the process of creating living, functional tissues to repair or replace tissue or organ function lost due to age, disease, damage, or congenital defects.

- Acell Inc
- Bioactive Surgical Inc
- Cord Blood Science
- Meridian Medical Technologies Inc
- Osiris Therapeutics Inc
- The Stem Cell Suture Co Inc



source: <http://www.osiris.com/>

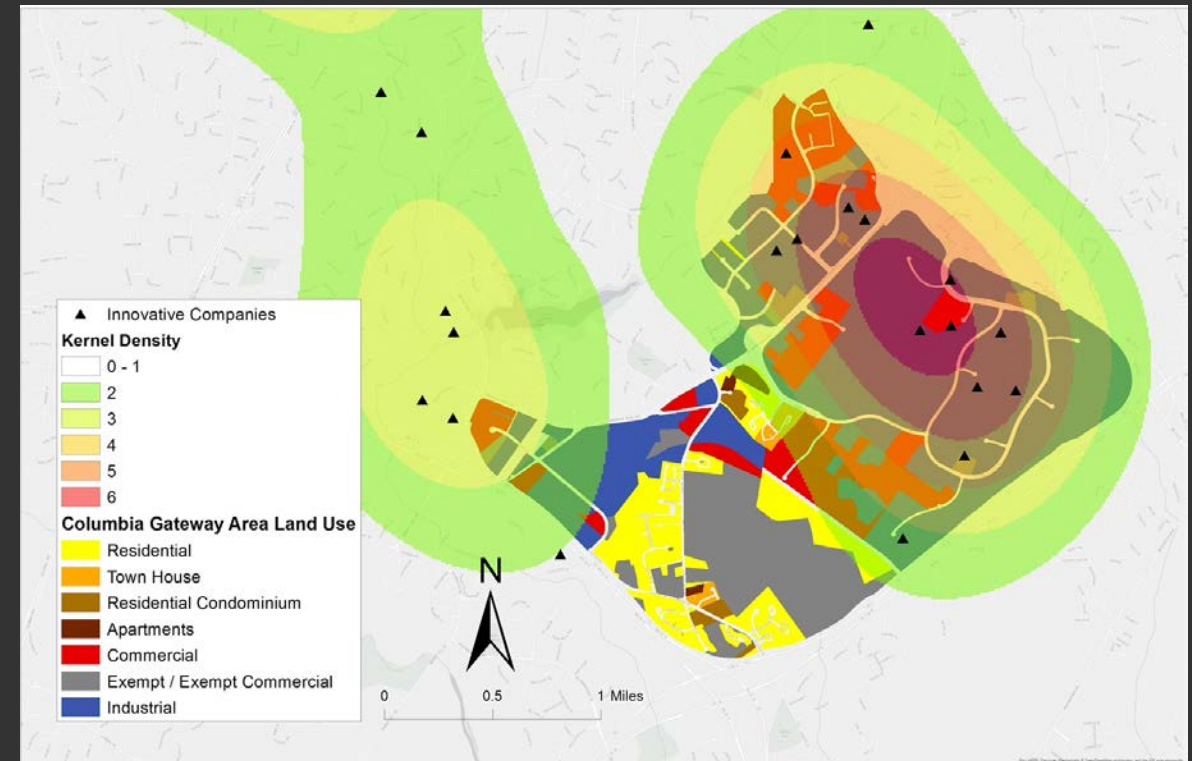




# STRATEGIES & RECOMMENDATIONS

# RECOMMENDATIONS & CONCLUSIONS

- Traditional Analysis
  - Background and basis for comparison
  - Limited applicability at the local level
- Spatial Analysis
  - Create an innovation district
- Network Analysis
  - Targeted economic development strategies within the Regenerative Medicine Technology Cluster





# QUESTIONS & COMMENTS



THANK YOU