Skills for the 21st Century

Higher Education Builds Talent for The Future

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Program Director, Global University Programs

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IBM University Programs – The Six Rs

1. **Research**
   Awards focus on grand challenge problems

2. **Readiness**
   Access to IBM tools, methods, and course materials to develop skills

3. **Recruiting**
   Internships and full-time positions working to build a smarter planet

4. **Regions**
   Regional innovation ecosystems – incubators, entrepreneurship, jobs

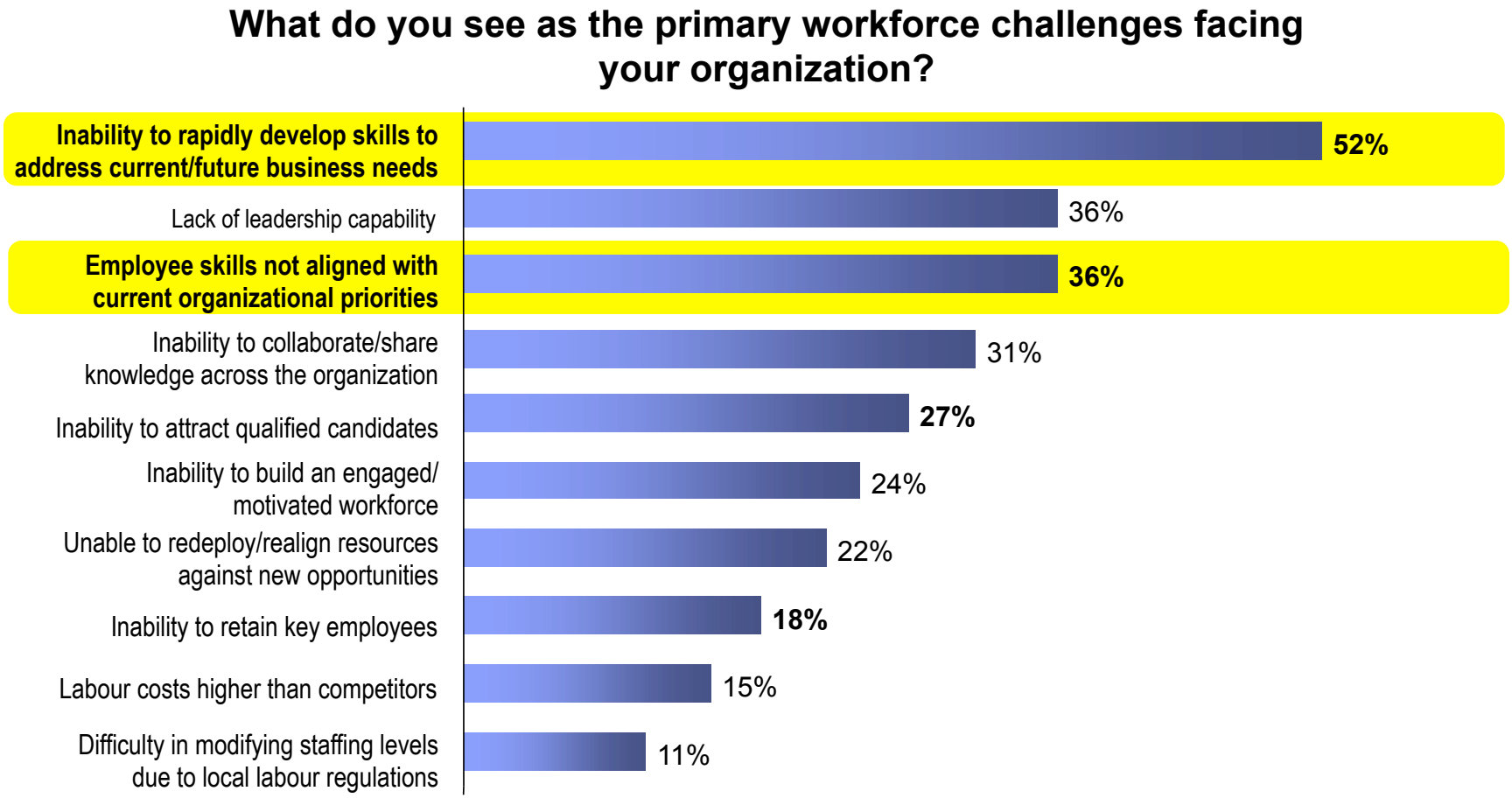
5. **Responsibility**
   Community service provides access to expertise/resources

6. **Revenue**
   Public-private partnerships build great universities and strengthen regions

Skills for the Future Needed Today

- Service Science
- Big Data and Analytics
- Cloud Computing
- Cyber Security
- Mobile Computing
- Smarter Planet

Among global organizations, the ability to rapidly develop skills is a critical challenge



Source: IBM Global Human Capital Study

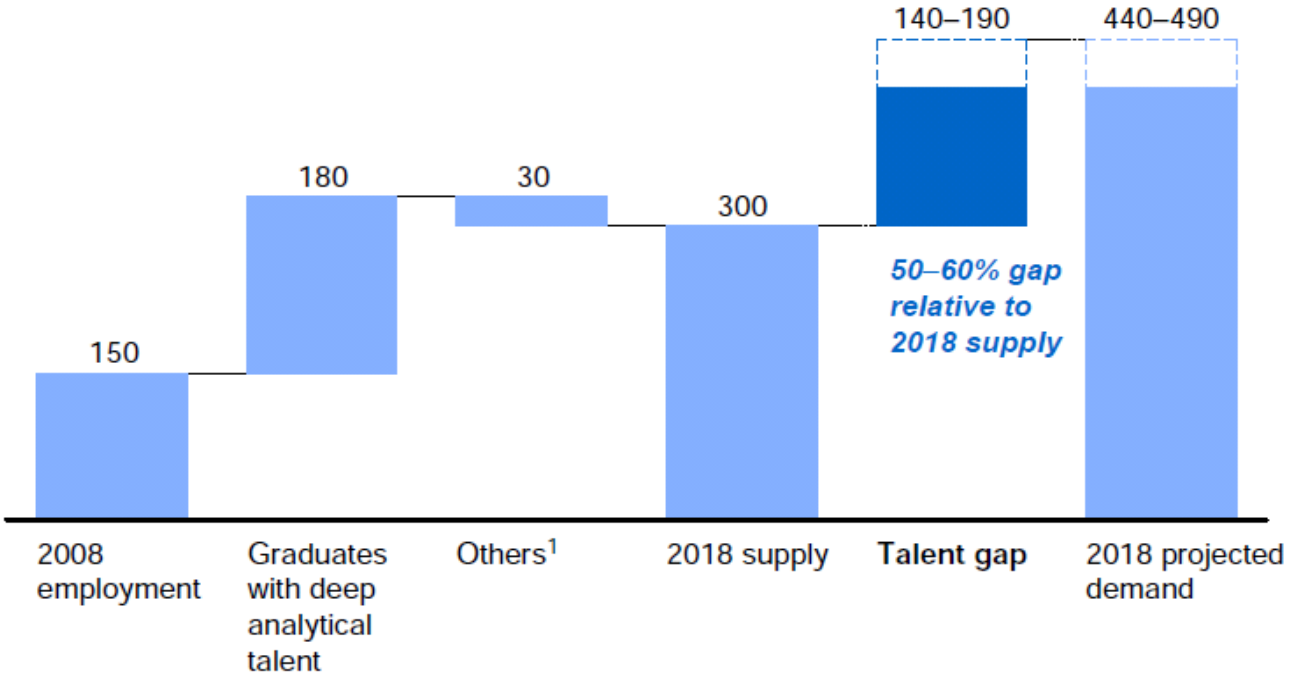
Analytics - Guaranteed Jobs!

"The United States alone faces a shortage of 140,000 to 190,000 people with analytical and managerial expertise and 1.5 million managers and analysts with the skills to understand and make decisions based on the study of big data (exhibit)."

New McKinsey Global Institute Report May 2011 http://www.mckinsey.com/mgi/publications/big_data/pdfs/MGI_big_data_exec_summary.pdf

Demand for deep analytical talent in the United States could be 50 to 60 percent greater than its projected supply by 2018

Supply and demand of deep analytical talent by 2018
Thousand people



1 Other supply drivers include attrition (-), immigration (+), and reemploying previously unemployed deep analytical talent (+).
SOURCE: US Bureau of Labor Statistics; US Census; Dun & Bradstreet; company interviews; McKinsey Global Institute analysis

Broad Range of Skills Categories

Industry Domain Expertise

Develop hypothesis, identify relevant business issues

Decision Making Executive and Management

Apply information to solve business issues

Data Manipulation Expertise

Manipulate and integrate structure and unstructured data – Big Data !!

Teams with Interdisciplinary Skills

Visualization Expertise

Interpret data sets, determine correlations and present in meaningful ways

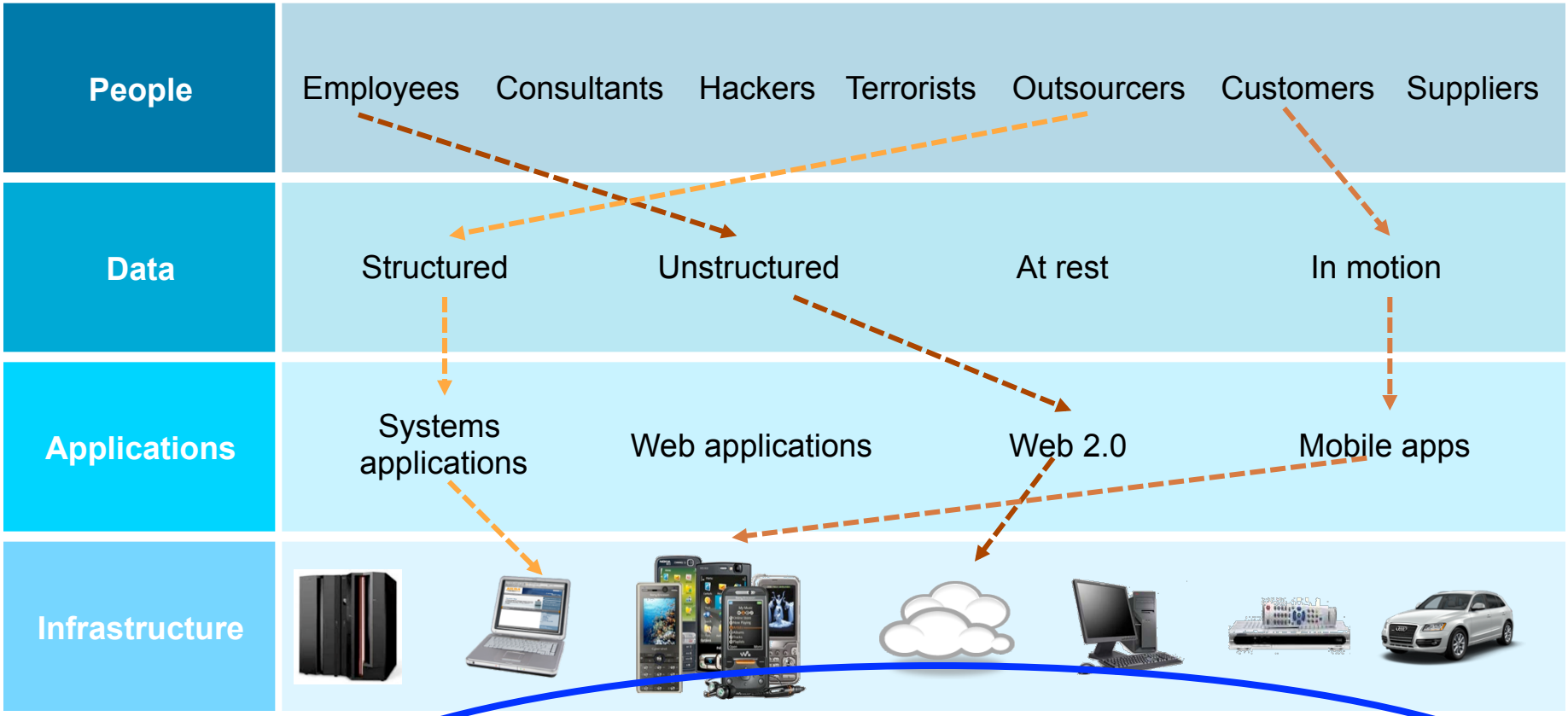
Math and Operations Research Expertise

Develop analytic algorithms

Tool Developers

Mask complexity and analytics to lower skills boundaries

Cyber Security requires systems thinking applied to business objectives – Holistic View …



CRITICAL SKILLS

IT Governance	Application Security	Systems Architecture
Security Intelligence	Network Security	Policies and Regulations
Digital Forensic	Endpoint Security	Data Privacy
Cyber Security Forensic Analysis	Data Security	Security Metrics

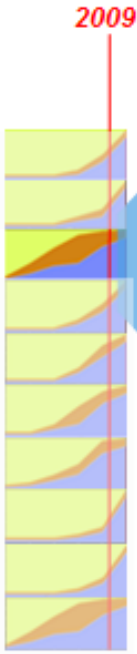
World's Large Labor Forces

A = Agriculture, G = Goods, S = Service

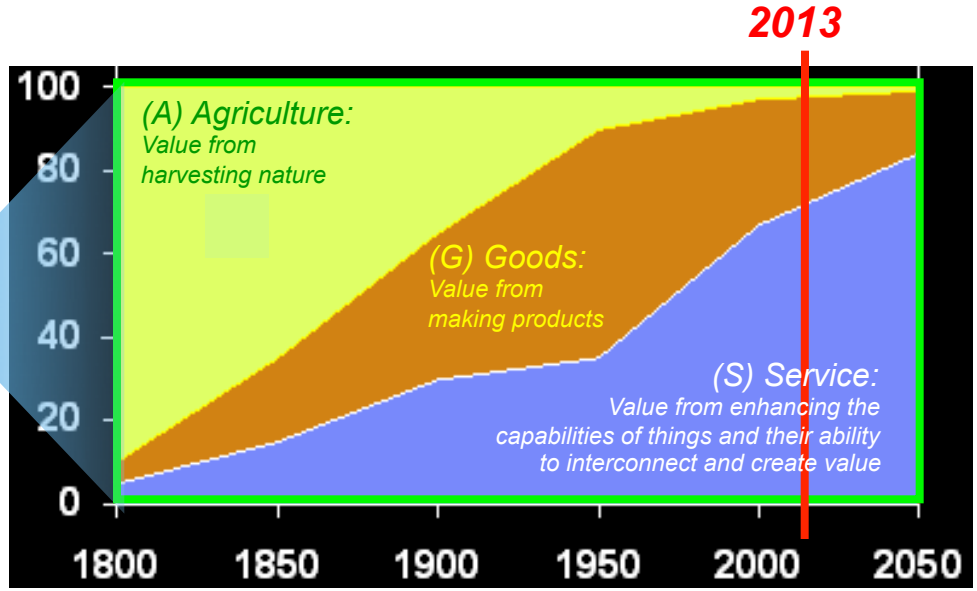
Nation	Labor %	A %	G %	S %	40yr Service Growth
China	25.7	49	22	29	142%
India	14.4	60	17	23	35%
U.S.	**5.1**	**1**	**23**	**76**	**23%**
Indonesia	3.5	45	16	39	34%
Brazil	3.0	20	14	66	61%
Russia	2.4	10	21	69	64%
Japan	2.2	5	28	67	45%
Nigeria	1.6	70	10	20	19%
Bangladesh	2.1	63	11	26	37%
Germany	1.4	3	33	64	42%

CIA Handbook, International Labor Organization

Note: Pakistan, Vietnam, and Mexico now larger LF than Germany



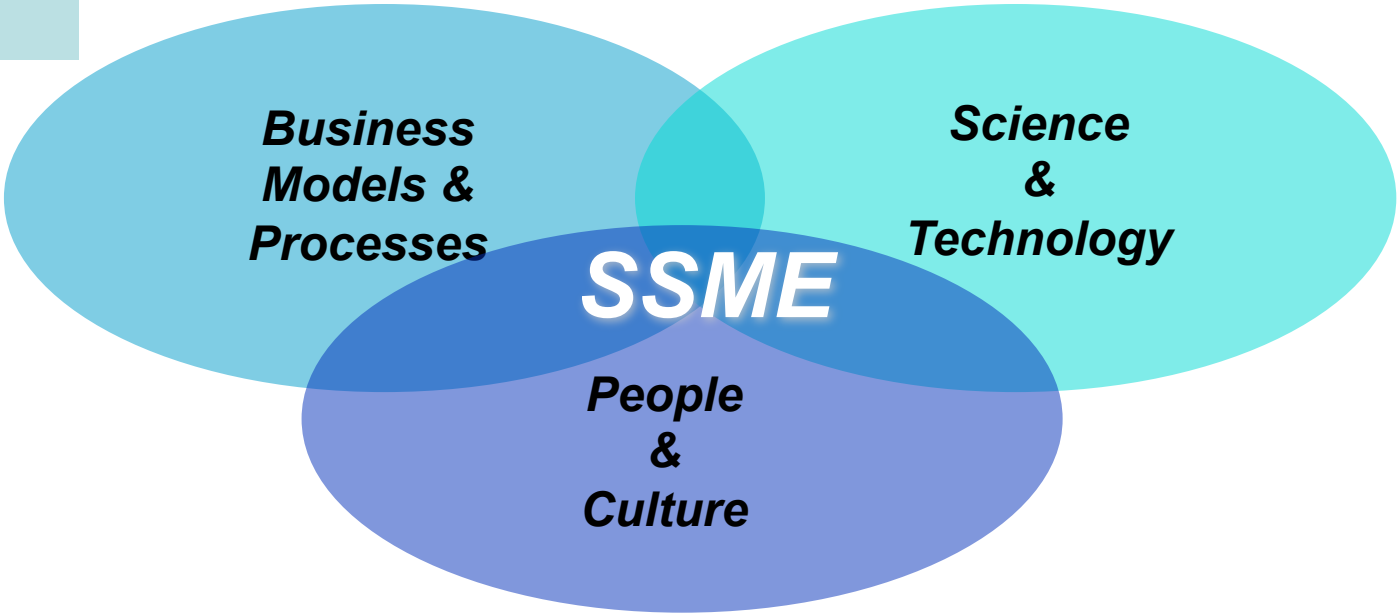
US shift to service jobs



The largest labor force migration in human history is underway, driven by global communications, business and technology growth, urbanization and regional variations in labor and infrastructure costs and capabilities.

Need for Academic Curricula Change:
Service Science, Management & Engineering (SSME)

2003-2013 and Beyond



The marketplace requires innovation that combines people, technology, value and clients

Six Sigma Falls Short in Service Innovation

Six Sigma Thinking

1. Eliminate variability (reductive)
2. Eliminate waste
3. Minimize cost
4. Map processes
5. Test hypotheses
6. Rely on large numbers to create certainty
7. Use process capability as final arbiter for decision making

Customer-Experience Led Innovation

1. Introduce variability when it creates preference
2. Allow the customer to judge what is waste
3. Tolerate additional cost when it creates preference that outweighs it
4. Map customer journeys
5. Explore important questions to make new hypotheses
6. Rely on small numbers to uncover new possibilities
7. Use demonstrated customer behavior as the final arbiter

Source: Peer Insights and Tekes

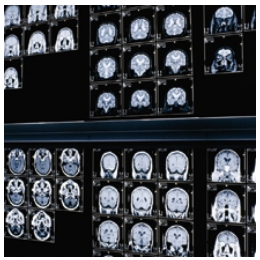
The World is Getting Smarter–about a diverse *ecology* of types of *service systems* that all interact

Critical Skills: Data, Analytics, Security, Cloud

Smart traffic systems

Intelligent oil field technologies

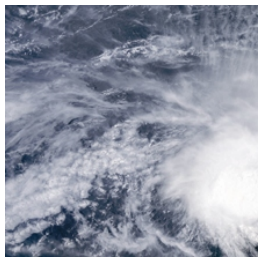
Smart food systems



Smart healthcare

Smart energy grids

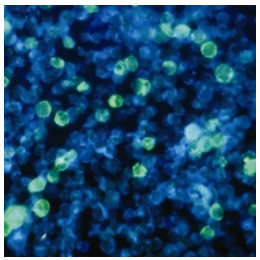
Smart retail



Smart water management

Smart supply chains

Smart countries



Smart weather

Smart regions

Smart cities

Universities Help Make Cities Smarter

Universities are mini-cites: a system of systems

Universities can be the innovation centers for Smart Cities.

Cities can be living labs for University research.

Universities produce the workforce for cities and government.

Universities are among the largest employers in a city.

Universities faculty, deans, provosts, presidents are often well connected to city governments.

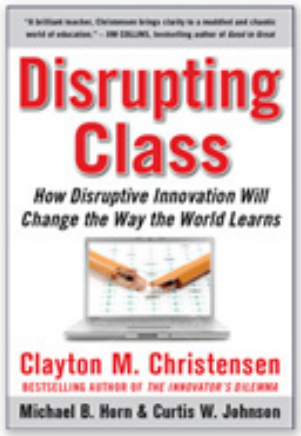
University Challenges

- Tuition too high
- Completion rates too low
- Mismatch of graduates' skills to jobs needed
- Measuring student and university performance
- Duplicate spending across colleges and departments
- Facilitating start ups and technology transfer to commercialization

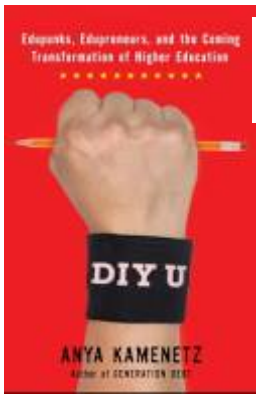
The Future of Education – Collaborative and Digital

MOOC

South Korea to go digital learning by 2014 – digitize all text books.



"By 2018, 90 percent of all courses will be delivered online." Clay Christensen



College takes time. College is expensive. College is exclusive.
College is no longer the only way to get a great education.

- **College Debt in US > Total Credit Card Debt**
- **Tuition is rising at a rate of 240%**

coursera

71,772,437 lessons delivered
KHANACADEMY

BETA P2PU Learn People Schools Blog Help
LEARN ANYTHING WITH YOUR PEERS.
IT'S ONLINE AND TOTALLY FREE.

IT-oLogy Advancing IT Talent™

75% of College Presidents at Public Universities Cite Online Learning as #1 Solution to Budget Crisis

iTunes U

O'REILLY SCHOOL of TECHNOLOGY

TED

UDACITY

YouTube

EDU › All Categories

Educational Continuum for Individuals & Institutions

Individuals/people/talent/disciplines

TECHNOLOGY IMMERSION

Any Device Learning

PERSONAL LEARNING PATHS

Student-Centered Processes

KNOWLEDGE SKILLS

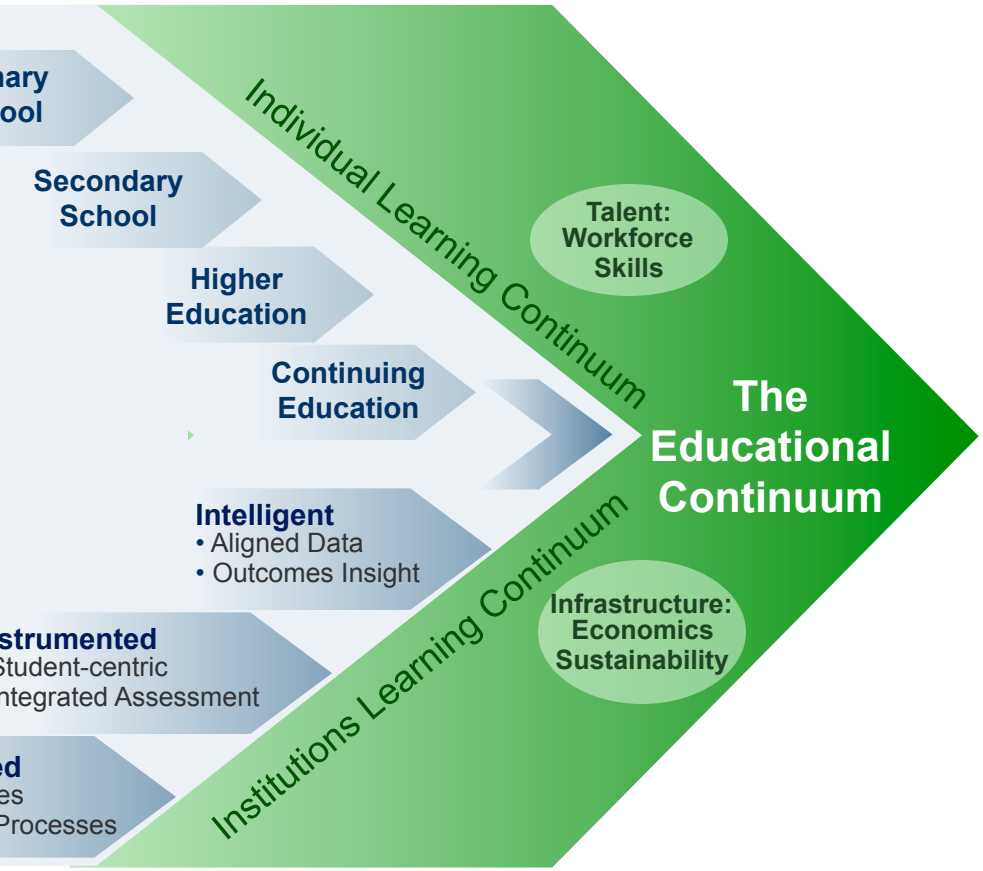
Learning Communities

GLOBAL INTEGRATION

Services Specialization

ECONOMIC ALIGNMENT

Systemic View of Education



Institutions/planet/infrastructure/systems

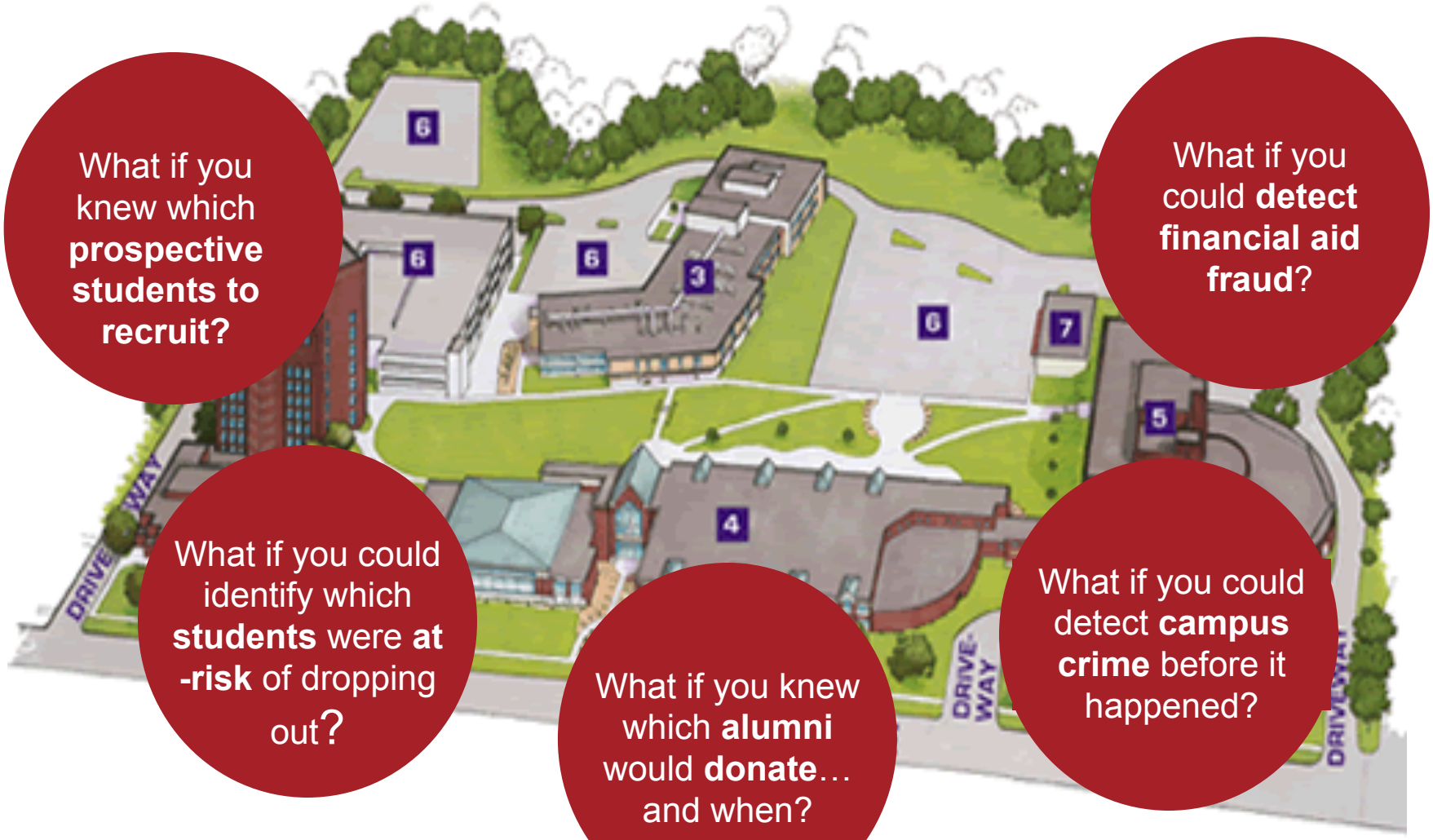
Improve Performance, Reduce Costs, and Create Jobs

- Analyze Data to Improve Student Performance and University Operations
  - Create personalized learning pathways
  - Manage student populations
  - Predict success of new recruits
  - Predict student failures and drop outs for timely intervention
  - Monitor and manage building energy and water
  - Manage campus safety and transportation

- Implement new platforms that enable learning, research and latest technology
  - BYOD – learn any place any time
  - Learning management systems that span lifelong learning and workforce
  - Virtual computing clouds

- Enable state and local job creation through Centers of Excellence that provide high demand skills in short supply

The Smarter Campus Uses Analytics



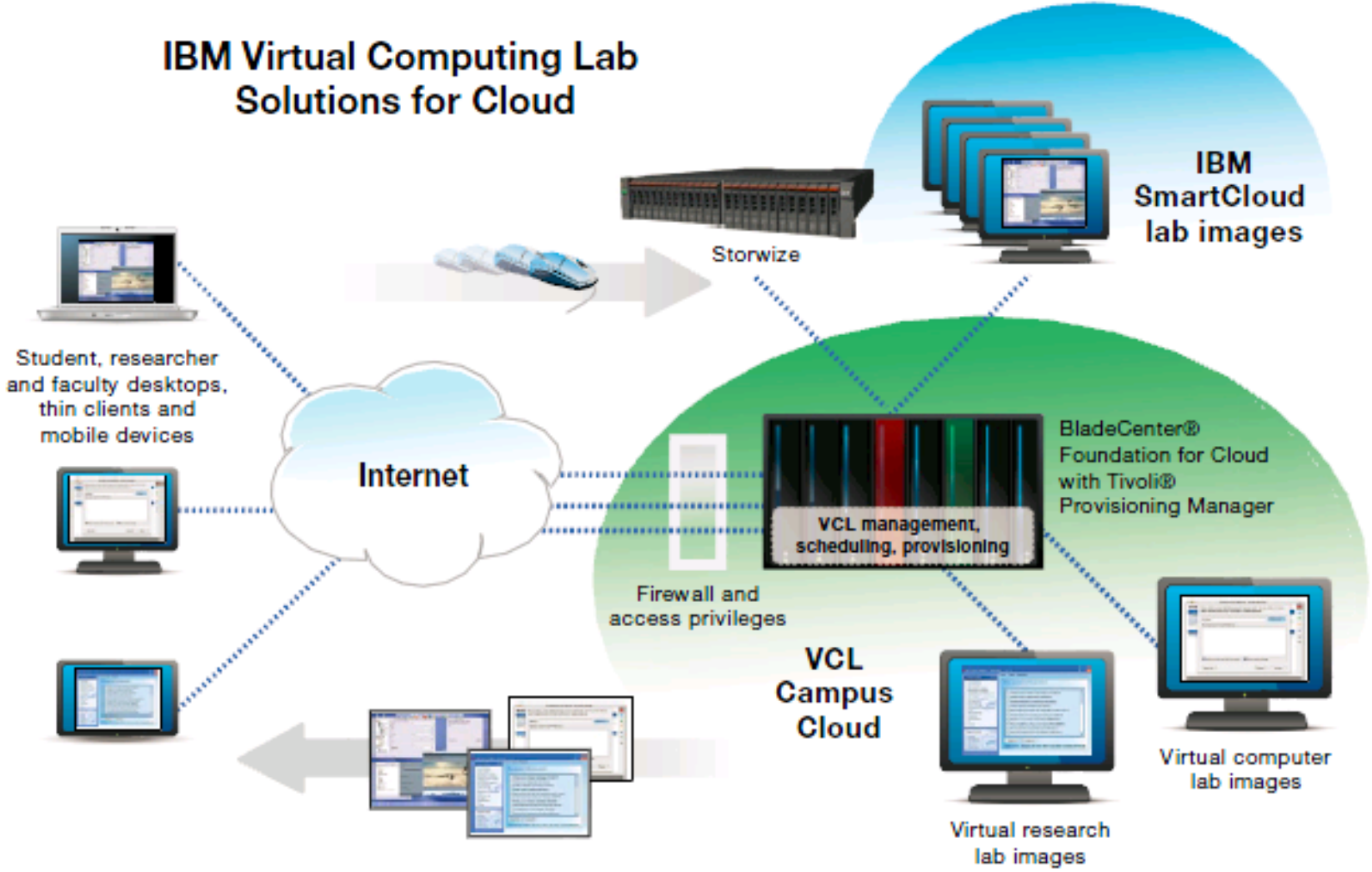
Investing in Educational Excellence

GWINNETT COUNTY PUBLIC SCHOOLS

- Analytics across multiple data sources
  - 162,000 Students
  - Enables comparison across 133 Education Facilities
  - Analysis beyond test scores and grades
- Proof of Concept to help predict student performance
  - E.g., Predict 8th grade math success based on 6th grade math performance
  - Timely intervention for identifying potential failures
- Measure effectiveness of actions taken to identify best practices and to ensure positive outcomes
- Incorporate digital educational content – anywhere, anytime use
- Winner of the 2010 Broad Award- $1M in high school scholarships

GWINNETT COUNTY PUBLIC SCHOOLS

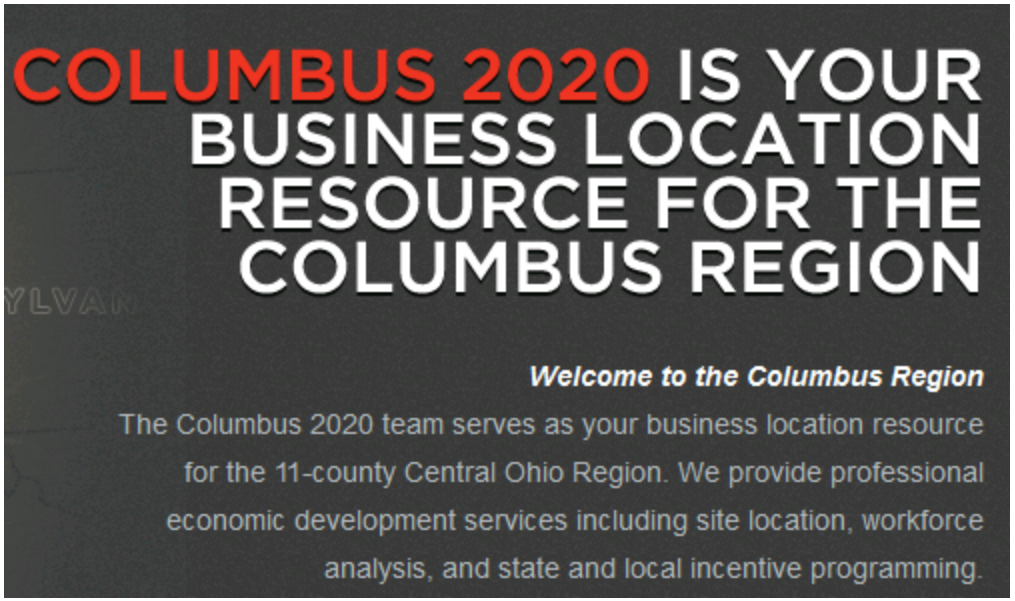
Virtual Computing Lab
High Performance Computing Shared Across Entire University



IBM Client Center – Analytics Solution Lab

A public-private partnership between State, City, University and Corporations

- **State of Ohio**
- **City of Columbus**
- **Ohio State University**
- IBM
- Cardinal Health
- Huntington Bancshares
- Nationwide
- Limited



Canada – Federal and Regional Investment in Analytics Center of Excellence

- IBM Canada Research and Development Centre
  - IBM, Federal Government, Ontario Government, and 7 Universities establish research and curriculum aimed at analytics solutions for a Smarter Planet
  - Universities of Toronto, Western Ontario, McMaster, Queen's, Ottawa, Waterloo and the Ontario Institute of Technology

- New Analytics Curriculum
  - University of Ottawa, York University, Ryerson University, Simon Frazier University, University of British Columbia

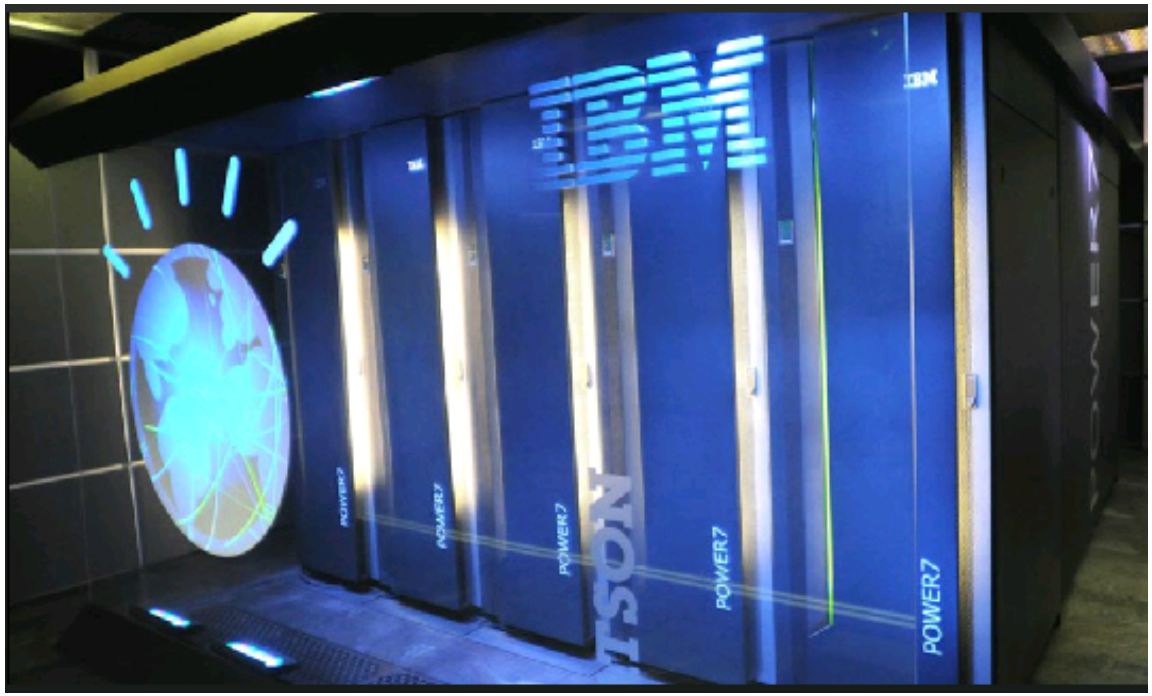
- Regional Centers of Excellence
  - Vancouver Institute for Visual Analytics
    - Simon Frazer and University of British Columbia
  - Nova Scotia Analytics Skills Centre of Competency
    - 11 universities and Community College System

Rutgers University Super Computing Center for Data Analytics

Goal to be one of top 10 Academic Computing Centers in the world

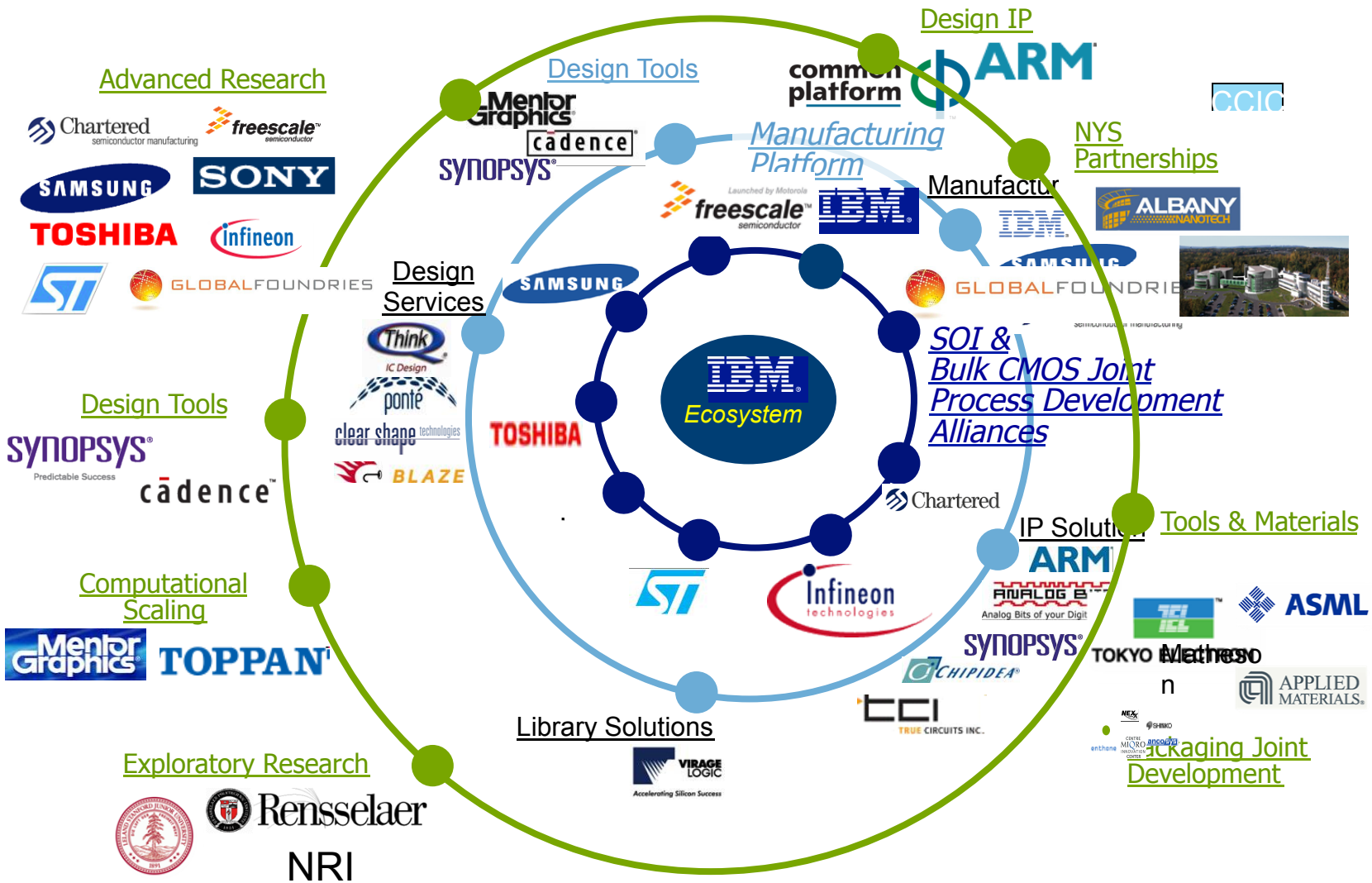
Rutgers Discovery Informatics Institute

- $3.3M Computer & Software
- Research
- Skills Building
- Service for local businesses to access computing power
  - Bristol-Myers Squibb
  - Johnson & Johnson
  - Xerox Corp
  - Siemans
  - JP Morgan Chase



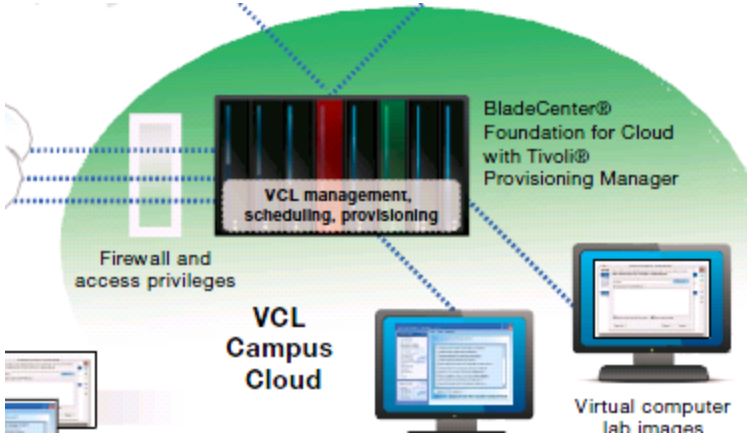
State of NY College of Nanoscale Science and Engineering

- **$100M initial investment by State of NY, SUNY and IBM in 2001**
- **$7B investment by GlobalFoundries to build two 300mm fabs in the area in 2011**
- **http://en.wikipedia.org/wiki/College_of_Nanoscale_Science_and_Engineering**



Where to Invest

- Skills for the Future
- Analytics for operations
- Open Cloud Platforms
- Centers of Excellence



Thank you !

Resources for University Faculty

- Academic Initiative Web Portal
- Access to Software Portfolio & Certifications
- Examples of University Programs
- Skills Taxonomies
- Job Descriptions
- Designing Curriculum White Papers
- IT Services Curriculum
- Publications and Trend Reports
- Case Studies and Real World Challenges
- Cool Videos
- Access to IBM Experts