STEM: Primary Driver of Future Economy

- The **National Academies Gathering Storm committee** concluded that a primary driver of the future economy and concomitant creation of jobs will be innovation, largely derived from advances in science and engineering. In fact, **STEM** jobs "are part of a **critical** cycle of economic growth fueling the economy and creating more downstream jobs".

- Information Communication Technology (**I C T**) makes up **49%** of STEM employment.

  – STEM jobs are expected to grow by 16.9% by 2020, **21.8% for I C T jobs**, of which the fastest growing are:

    - Software developers
    - Systems analysts
    - Computer support specialists

STEM Talent Gap – What's That?

- The **worldwide STEM talent gap** continues to grow at an alarming rate, in other words, we're creating jobs that we don't have skilled workers to fill.
  - **Women** are grossly underrepresented in STEM jobs at only **25%.**

- According to the Bureau of Labor Statistics, *Occupational Employment Projections to 2018*, there will be **1.2 million job openings** for computer science graduates by 2018, but current U.S. graduation rates will provide qualified workers for only one-third of those positions, which means that millions of jobs will go unfilled.
  - Computer and mathematical occupations are expected to add 785,700 new jobs from 2008 to 2018, and, as a group, they will grow more than twice as fast as the average for all occupations in the economy, according to projections.
  - It is anticipated that computer specialists will account for the vast majority of this growth, increasing by 762,700 jobs.
  - Demand for computer specialists will be driven by the continuing need for businesses, government agencies, and other organizations to adopt the latest technologies.

- By 2020 STEM jobs will have a **50% gap** in talent to fill them.

Huge Opportunity/Need: Analytics

Discovery and communication of meaningful patterns in data.

- Areas of study & expertise:
  - Computer Science, Math, Economics, Informatics, Information Science, Statistics
- Skills needed:
  - Computer skills, Math, Communications, Data Analysis
- Jobs in many sectors:
  - Healthcare, Environment, Security, Finance, Policing

Today's Analytics…

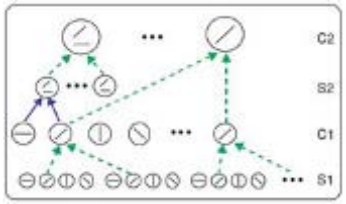
- Fight crime
- Cure diseases
- Save energy
- Conserve water
- Prevent accidents
- Predict shopping habits
- Win games like *Jeopardy!*

Analytics: Broad Range of Skills Categories

Data experts to manage big sets of data

Strategists to help shape which questions to ask

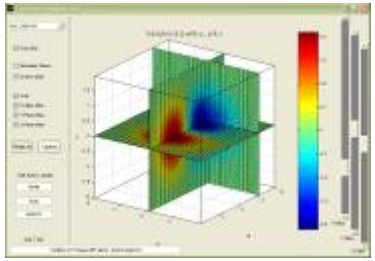
Mathematical and operations research to develop analytics algorithms



Managers to know when and how to use data for making decisions

Tool developers to make it easier for others to use to analyze information

Visualization skills to interpret data and present in meaningful ways



Big Data Analysis Talent Gap

"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." - McKinsey Global Institute.

"Demand for deep analytical talent in the U.S. could be 50 to 60 percent greater than its projected supply by 2018 (300,000 projected talent, 440,000-490,000 projected need.)"

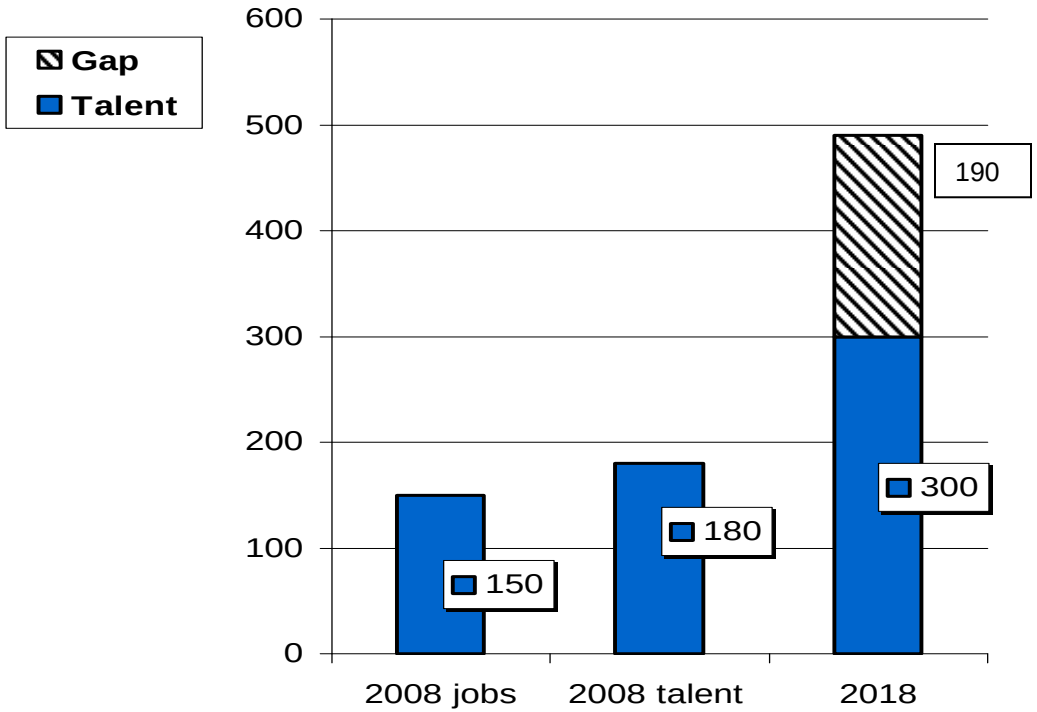
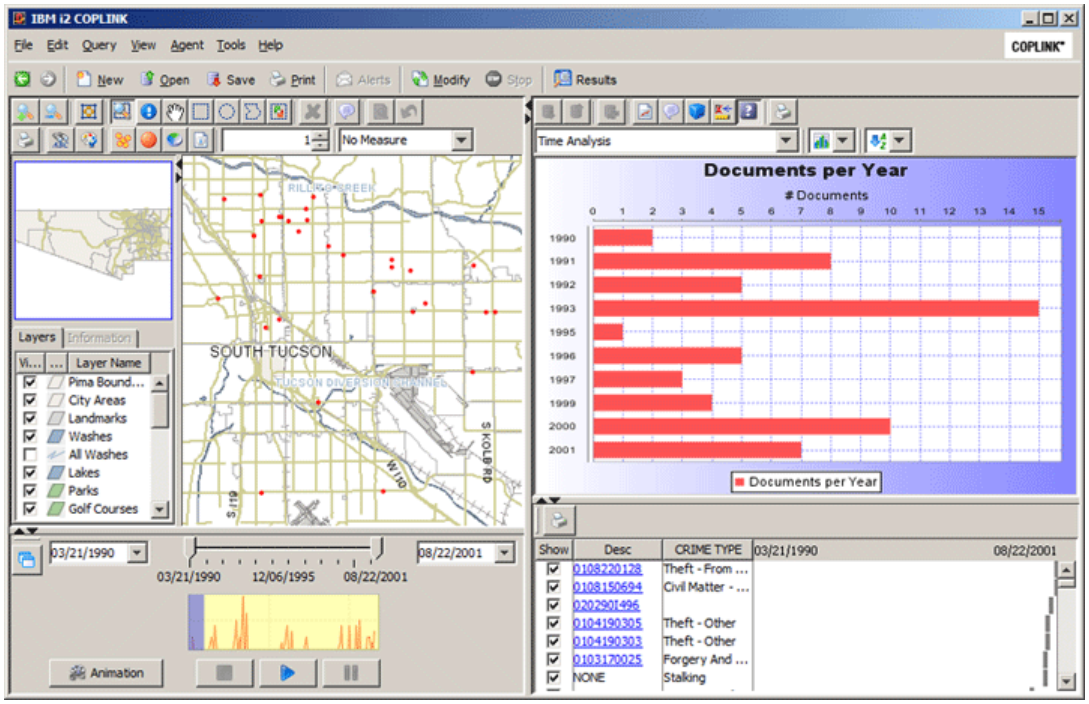


Chart showing talent versus employment in data analysis to 2018 in thousands of persons.

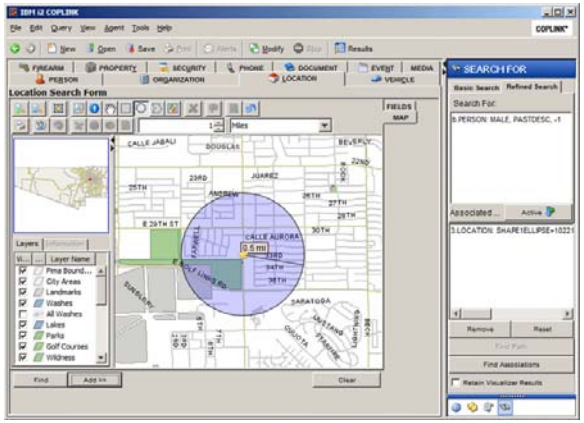
Analytics for Policing & Government Agencies

- The use of analytical software has allowed police departments to use the data they already have to make significant progress in crime prevention.
- Analytical software helps government and policing agencies recognize patterns in activity, e.g. most stolen vehicle in a metropolitan area.



IBM i2 COPLINK provides analysis of criminal activity and incident trends.

Predictive Policing Case Study



What they did

- Using analytics software and new methods, the Memphis police were able to focus existing patrol resources exactly when and where needed 24x7

How they did it

- Through the use of analytics, the Memphis PD were able to recognize crime trends as they were actually happening giving precinct commanders the ability to change their tactics at a moment's notice – thwarting crimes before they happen

A bold experiment yields big results

- **30% reduction in Serious Crime**
- **15% reduction in Violent Crime**
- **4x increase in solved Felony Assault Unit cases**

Policing Smarter, not harder

- Analytics gives police the advantage over criminals through both insight and agility – *predictive modeling!!*

Focus on STEM Programs for Students

- A Google search on “getting kids interested in stem” returns 7,520,000 results

- Just this month, IBM opened a 6,600 sq. ft interactive THINK exhibit INNOVENTIONS at *Epcot*® at the *Walt Disney World*® Resort designed to showcase how the world can work better with the help of technology and innovation.
  - IBM has created free science, technology, engineering and math (STEM) lesson plans for middle and high school science teachers, along with a companion app for Apple iPads and 10” Android tablets.

- P-TECH is a grade 9 through 14 STEM Pathway institution that confers both the high school diploma and an Associate’s degree in technology at no cost to the student. It is designed to prepare its graduates with a rigorous education in STEM (science, technology, engineering, mathematics) subjects plus the real-world skills of the corporate workplace.
  - P-TECH is a partnership among the Department of Education, The City University of New York, the New York City College of Technology, and IBM -- which provides volunteer mentors for students and faculty.

The People of a Smarter Planet

Who are they?

Total Global Population:

7+ billion people

Of these…

- **6 billion** have a cell phone

- **1.2+ billion** are people with disabilities

- **1+ billion** are mobile workers

- **600+ million** are over the age of 60

- **900+ million** have low literacy or are illiterate

- **Fewer than half speak 1 of the 10 major "link languages"** as their primary language.
- **5 billion** have *never* used the Internet.

- **1 billion** have used the Internet for less than 5 years.

Who Can Fill This Looming Gap?

- There is a large underutilized and unemployed working age population comprised of
  - persons with disabilities
  - the aging population
  - foreign language speakers
  - economically disadvantaged persons

- An estimated **386 million** of the world's **working-age** people are **disabled**, says the International Labour Organization (ILO). Unemployment among the disabled is as high as 80% in some countries. Often employers assume that persons with disabilities are unable to work.
  - In 2011, only 17.8% of persons with disabilities were employed in the United States.

- People are living longer. **By 2025, the 60+ segment will comprise 20%** of the population in most industrialized nations. Americans, for instance are working beyond the retirement age for both financial and personal fulfillment.

- Fewer than half of the world population speak 1 of the 10 major "link languages" as their primary language

- **900+ million** of the world's population are economically disadvantaged -- with **low literacy** or are illiterate.

US Executive Order 13548

- Signed by President Obama, July 2010
- Hiring of **100,000 Persons with Disabilities**
- Retention of employees injured or become disabled during employment.
- *US Customs and Border Patrol is committed… to establish and maintain a diverse, inclusive, and highly engaged workforce. …as it increases the potential pool of highly qualified people from which we draw our talent.*
  - **Department of Homeland Security, U.S. Customs and Border Protection**

Filling the Big Data Talent Gap

- Government agencies are looking to fill talent gap with 100,00 persons with disabilities to increase potential pool of highly qualified people.
- Persons with disabilities can help fill the data analytics talent gap by providing additional talent in the area of analytics.
- Government and policing agencies are looking to IBM and other technology companies for tools and resources to help manage and analyze big data.
- IBM is committed to making these tools accessible.

Education / Learning

- Training this diverse new workforce would be impossible without the innovative technologies and distance / online education now available.
  - The Prevalence of Online Courses: 77% of college presidents report that their institutions now offer online courses. **89% of four-year public colleges and universities offer online classes**.
  - Online Students: Roughly one-in-four college graduates (**23%)** report that they have taken a class online. Among those who have graduated in the past ten years, that number doubles to 46%.
  - The **Future of Online Learning**: 15% of college presidents say most of their current undergraduate students have taken a class online, and 50% predict that 10 years from now most of their students will take classes online.
  - **Digital Textbooks**: Nearly two-thirds of college presidents (62%) anticipate that 10 years from now, more than half of the textbooks used by their undergraduate students will be entirely digital.

Free Online Courses

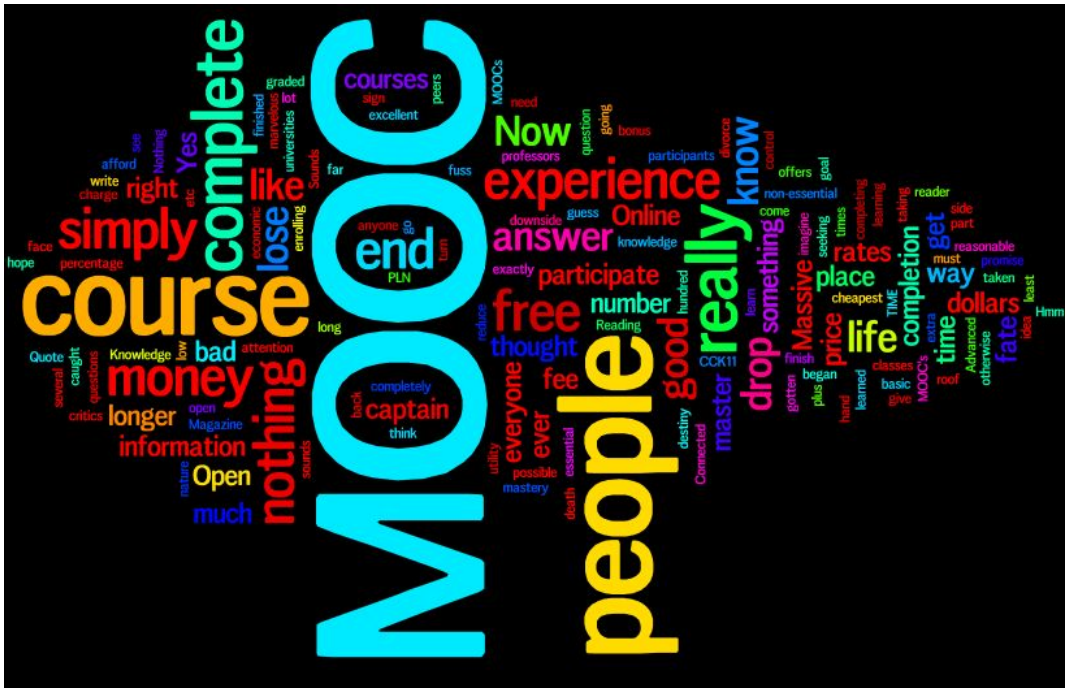
- Massive Online Open Courses are being offered by some prominent universities such as MIT, Harvard and UC Berkeley allowing a wide global audience to take free online courses through the non-profit EDX. By making these courses accessible, allows for the largest possible audience to study and train in areas that some may have found out of reach.

- Khan Academy: Higher Learning Through YouTube offers over 3400 videos.
  Quote from Salman Khan, “The Internet can make education far, far more accessible, so knowledge and opportunity can be more broadly and equitably shared. Quality education need not be dependent on showplace campuses.”

- 1,800 free courses are offered through MIT’s OpenCourseWare.

- Coursera Inc., a start-up founded by two Stanford professors, offers free online classes from prestigious schools.

- 530 free online courses from top universities including UC Berkeley, Stanford, Yale, Emory, Harvard, Carnegie Mellon and more are available from Open Culture.



How can accessible technology help?

- The availability of **accessible technology** can help support training and enabling these underutilized groups to join the workforce and help fill the **STEM gap** and jobs created by **STEM technologies.**

- With today's growing economy spurred on by advances and innovation in information technology (IT), accessible technology can play a critical role in providing economic opportunity and employment to the widest possible audience. Accessible technology can help fill the STEM talent gap in many ways:

  - Opens up technology and careers in technology to **persons with disabilities** by making applications and systems available to assistive technologies, supporting accessibility standards and providing accessible educational materials.

  - Opens up technology and careers in technology to the aging population; some of whom are switching careers. The aging population depends upon large text, high contrast, speech recognition and other accessible solutions.

  - Opens up technology to foreign language speakers and low-literacy through accessible education and technology that supports captioning and translation.

- **Accessible technologies** provide even more flexibility and help everyone overcome **challenging circumstances** such as low light, ambient sound, on-the-go communication.

Assistive Technology Alignment

People with disabilities, aging population, foreign language speakers

- New accessible technology innovations for people with disabilities are being developed almost daily, and these technologies, in addition to the creation of new industries, have the potential to provide more jobs. These innovations include:
  - Speech recognition
  - Screen readers
  - Kindle and other tablet reading devices which support high contrast.
  - Audio Description devices
  - Captioning
  - Alternate input and output devices including tactile forms

- Accessible technologies allow the aging population to remain or make the switch to Information Communication Technology jobs as they extend their working years. These include:
  - Zoomable text displays
  - High contrast
  - Speech recognition
  - Hearing aid improvements
  - Alternate input and output devices

- Globally integrated enterprises incorporate many employees who do not speak the same language (foreign language speakers). Innovations and adoption of captioning and translation technologies enable these employees and potential employees to communicate efficiently with their colleagues across the world.

Assistive Technology Alignment

Agriculture, Literacy and I T

- Two thirds of the world's 870 million illiterate people live in rural India.
- Agriculture is the main source of employment for over 40% of population in developing nations including rural India.
- The sales and pricing of goods and crops depends upon many factors; pests, diseases, new techniques.
- This information along with pricing systems is based in IT systems.
- In rural India, researchers and NGO workers are striving to provide a better speech recognition program in support of these rural farmers to provide access to pricing data and systems and better employment and sales opportunities.

In Summary

- **Accessible Technologies** are projected to reach a **multi-billion** market by 2020.
- Iin the US. **STEM jobs** are **critical** for our future **economic growth.**
- **Accessible technologies** help **fill the gap in STEM** jobs and jobs created by STEM technologies by providing access to education and employment to the widest possible population.

Backup

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Thank you!

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