Continuing Innovation in Information Technology

Fundamental research in IT underpins the creation of billion-dollar-plus IT market segments and a vital U.S. IT industry through a complex partnership between universities, industry, and government.

The first version of this figure was published in the 1995 report *Evolving the High Performance Computing and Communications Initiative to Support the Nation's Information Infrastructure*. The original figure, which was updated in 2002 and 2003, dispelled the assumption that the commercially successful IT industry is self-sufficient. It underscored the extent to which industry instead builds on government-funded university research—sometimes through long incubation periods of years and even decades.

As illustrated in this figure from the 2012 report *Continuing Innovation in Information Technology*, computing research and its impacts have since continued to evolve and blossom. The figure illustrates how fundamental research in IT, conducted in industry and universities, has led to the introduction of entirely new product categories that ultimately became billion-dollar industries. It reflects a complex research environment in which concurrent advances in multiple subfields have been mutually reinforcing, stimulating and enabling one another and leading to vibrant, innovative industries exemplified by top-performing U.S. firms. Such research often starts as a search for fundamental knowledge but time and again produces practical technologies that enable significant economic impact.

The gray lines illustrate the rich interplay between academic research, industry research, and products and indicate the cross-fertilization resulting from multi-directional flows of ideas, technologies, and people.

IT Sectors with Large Economic Impact

Companies listed (top): Motorola, AMD, Intel, HP, eBay, Akamai, Yahoo!, IBM, Electronic Arts, Qualcomm, Symantec, Juniper, Facebook, Twitter, VMware, HP, Adobe, Autodesk, Nuance, Texas Instruments, Microsoft, XBox, nVidia, Apple, Cisco, Amazon, Oracle, nVidia, Pixar, iRobot, iPhone, Dell, Google, iPod, Intuitive Surgical

Sectors (top, blue): Broadband & Mobile, Microprocessors, Personal Computing, Internet & Web, Cloud Computing, Enterprise Systems, Entertainment & Design, Robotics & Assistive Technologies

Areas of Fundamental Research in IT (bottom): Digital Communications, Computer Architecture, Software Technologies, Networking, Parallel & Distributed Systems, Databases, Computer Graphics, AI & Robotics

Timeline years: 1965, 1970, 1975, 1980, 1985, 1990, 1995, 2000, 2005, 2010

Legend: — University — Industry R&D ··· Products ▮ $1 Billion Market ▮ $10 Billion Market