



Leading Science-Based Business

- Moderator: **Vicki L. Sato**, *Professor of Management Practice*
- Panelists: **Kim B. Clark**, *Former Dean of the Faculty; President, Brigham Young University–Idaho*
Raymond V. Gilmartin, *Professor of Management Practice*
Frank Moss, *Director, MIT Media Lab*
James D. Robinson III, *Cofounder and General Partner, RRE Ventures LLC*
Willy C. Shih, *Professor of Management Practice*

Overview

Increasingly, science and technology will drive business. This will include traditional scientific-based industries, such as pharmaceuticals and technology. But the definition of science-based businesses will expand as companies in all industries use science and technology to strengthen their customer relationships and to create competitive advantage.

How companies conduct R&D and commercialize innovation will also change. No longer will all R&D be done internally. Increasingly companies will form networks, increase the use of partnerships, and use other creative structures to tap into more discoveries and to mitigate R&D risks.

And, increasingly science-based businesses will be led by individuals who possess both deep scientific knowledge and significant business expertise, including individuals educated in the science-based programs at HBS.

Merck recognized that great drug-related science was happening all over, including at small companies.

In 1999, the company established an “external research” program, and formed relationships with startup companies that had great science. Merck also decided it wanted to be co-located where great science was being conducted, particularly in Boston and on the West Coast. Through this shift in how Merck related to outside R&D efforts, the company created a network of relationships with leading-edge startup companies. This is expected to pay off handsomely, particularly in the area of cancer research.

“One of the major changes I have seen is the way that Merck relates to the outside world.”

— Raymond V. Gilmartin

In addition, Merck has also changed how it conducts R&D by looking closely at and changing its drug discovery process to increase the speed of drug discovery. These changes in philosophy have resulted in creating a more robust pipeline that is going to come to market more quickly.

Context

This panel discussed the challenges and opportunities related to leading a science-based business.

Key Takeaways

- **Science-based businesses are likely to become even more important.**
Science will continue to be a driver of business. Science-based businesses are private enterprises that are directly involved in scientific research, with a commitment to R&D and with executives who speak the language of science. Key trends affecting science-based businesses include: an increase in the rate of scientific change; the globalization of science, leading to greater competition; and a decrease in the lag time between a scientific discovery and the commercialization of this discovery.
- **Large, established science-based companies are rethinking their R&D models.**
In the past, many large science-based companies did all or most of the R&D internally. For years, Merck rarely engaged in R&D-related relationships with outside firms, and in those limited instances when Merck did a deal with an outside firm, it tended to be a foreign company that had fairly advanced molecules.

In the 1990s, however, that changed. Due to improved knowledge of the human genome and new drug discovery tools, there was a “democratization of drug discovery.”

- **At science-based companies, there is often a mismatch in the time horizon between investments and business results.**

At large science-based businesses, investments are often long term, with very long time horizons, sometimes taking 10 or 20 years. However, these companies are under constant pressure from analysts for near-term profitability. Dealing with this mismatch in time horizons is one of the great challenges faced by research-oriented organizations.

This is a different environment than in startups, where all eyes are focused on the next round of funding, requiring more immediate results.

Ways that organizations try to navigate this issue include working very hard to expedite commercialization, filing patents to protect intellectual property, managing downside risk by stopping projects that aren't panning out, educating investors, and having leaders with a long-term time horizon who try not to be held hostage to quarterly earnings or daily stock price fluctuations.

“Even though a company’s investment horizons may be long, remember Willy’s Vacation Model. You can go to a great destination, but you have to have interesting stops along the way.”

— Willy C. Shih



- **The lines between science-based businesses and other industries are becoming blurred.**

The definition of science-based businesses is becoming broader. There are traditional science-based industries, like pharmaceuticals, where the core focus is scientific research and products. However, the reality is that science and technology are increasingly playing a large role in a wide variety of industries, such as consumer electronics, finance, and media. Companies in these industries are also becoming businesses where science and technology play a critical role in how companies connect with and serve customers.

One example is Bank of America (BoA). For the past 20-30 years, BoA has generated significant profits from late fees and penalties. But the company doesn't see this as a viable long-term growth area. To help find areas for growth and to strengthen customer relationships, BoA is turning to technology for solutions and is working with the MIT Media Lab. One idea being looked at is "effective computing" to help bank tellers and customer service representatives read customers' emotions. In addition, technology for behavioral economics is being used to help better understand how and why people buy.

"Businesses in all industries are looking at how new scientific innovations can help them better connect with customers."

— Frank Moss

- **Leaders of science-based businesses need tools and methodologies to think about and manage risk.**

By their nature, science-based businesses are high-risk undertakings. In this highly uncertain environment, managers can make better decisions by using tools and analytical methods that incorporate risk. Net present value (NPV) analysis is largely inadequate in assessing the value of potentially breakthrough discoveries, since it assumes a baseline of business as usual. Techniques like decision trees, Monte Carlo simulation, and real option theory are better approaches for analyzing decisions with high risk. These tools provide managers with signposts for when a project should not proceed.

"One of the major needs with managing large R&D budgets is knowing when to stop. It can be hard to stop a team from working on something they devoutly believe in."

— James D. Robinson III

In cases where a project is stopped, organizations should not simply throw the results away. There may still be value in the work. In the world of pharmaceuticals, for example, it may be possible to sell a molecule to someone else. Alliances are another way to minimize risk. Science-based businesses may consider partnering with other companies that can assume some of the risk related to a project.

"We need to teach students and managers working in environments where there is a lot of risk how to cut off the lower tail, and make the upper tail more likely in ventures."

— Kim Clark

- **HBS is actively pursuing management education related to science-based businesses.**

In 2000, Harvard Business School recognized that science-based businesses would become more prevalent and important. This presented a unique opportunity for HBS to be proactive in forging relationships with other parts of the University such as the School of Engineering, the Medical School, and other areas where innovative research is taking place. The idea was to attract people with deep scientific knowledge (both teachers and students) to HBS who would not otherwise be there and equip them with the business knowledge and skills to lead science-based businesses.

"We believed that [by focusing on science-based businesses] we could attract people to HBS who otherwise we would never see, and we could train and develop them."

— Kim Clark

As a result, HBS has created an innovative course called Inventing Breakthroughs and Commercializing Science. Small teams comprised of students from across Harvard—including the Business School, the Law School, the Medical School, and elsewhere—study cases about how important inventions were commercialized. These teams then find scientific ideas within Harvard University and determine how to commercialize them. Executive programs have also been developed focused on managing and leading science-based businesses.

Other Important Points

- **Science-based leadership.** The key traits required of leaders of science-based businesses include being comfortable with science and technology, being able to attract and manage talented people, having good instincts in picking great scientific leaders, and being able to focus the organization on a higher purpose of creating value for society; not just increasing shareholder value.
- **Improving R&D lab productivity.** Kim Clark has been involved in studying why some R&D labs are far more successful than others, by any metric—patents filed, products commercialized, etc. He said that the key factors driving exceptional performance are: a focus on fewer projects; an understanding by the scientists in the lab of the implications of their research; and the leadership of the lab and teams within the lab.
- **Collaboration technologies.** Breakthroughs like Web 2.0, cloud computing, virtualization, and open source provide capabilities for science-based businesses to collaborate outside company boundaries and tap into the creativity of the world.



Speaker Biographies

Vicki L. Sato (Moderator)

Professor of Management Practice

Vicki Sato is Professor of Management Practice at HBS and Professor of the Practice in the Department of Molecular and Cell Biology at Harvard University. She is a business advisor to Atlas Ventures and other enterprises in the biotechnology and pharmaceutical industries.

Sato recently retired from Vertex Pharmaceuticals, where she had served as president since 2000, with responsibility for R&D, business and corporate development, commercial operations, legal, and finance. Before becoming president, she was chief scientific officer, senior vice president of R&D, and chair of the scientific advisory board. Under her leadership, Vertex created a diversified pipeline of drugs, including two HIV protease inhibitors approved and marketed by GlaxoSmithKline, an oral protease inhibitor (VX 950) for the treatment of hepatitis C, now in late clinical development, two anti-inflammatory drug candidates in clinical development, a novel molecule for the treatment of cystic fibrosis now in Phase I clinical testing, and two kinase inhibitors being developed by Novartis and Merck for the treatment of cancers. A new molecule for the management of pain has been recently licensed to GlaxoSmithKline.

Before joining Vertex, Sato was vice president of research at Biogen Inc., where she led research programs in the areas of inflammation, thrombosis, and HIV disease and participated in the executive management of the company. Several molecules from those programs have now reached the marketplace. She also served as a member of the Biogen Scientific Board.

Sato is a member of the boards of directors of Bristol-Myers Squibb Company, PerkinElmer Corporation, Infinity Pharmaceuticals, and Alnylam Pharmaceuticals. She is also a trustee of the José Mateo Ballet Theatre, chair of the Overseers of the Isabella Stewart Gardner Museum, and an advisor to the Accelerated Cure Project, a nonprofit organization committed to finding a cure for multiple sclerosis.

Sato received her BA from Radcliffe College and her MA and Ph.D. from Harvard University. After postdoctoral work at the University of California at Berkeley and Stanford Medical Center, she was appointed to the faculty of Harvard University, where she was an assistant and associate professor of biology.

Kim B. Clark

Former Dean of the Faculty; President, Brigham Young University–Idaho

Kim Clark, dean of the faculty at HBS from 1995 to 2005 and a member of the faculty since 1978, received his BA, MA, and Ph.D. degrees in economics from Harvard University. Since 2005, he has served as president of Brigham Young University–Idaho.

Clark's research is focused on modularity in design and the integration of technology and competition in industry evolution, with a particular focus on the computer industry. His earlier research focused on technology, productivity, product development, and operations strategy. He is the author or coauthor of numerous books and scholarly publications.

A native of Salt Lake City who was raised in Spokane, Washington, he and his wife are the parents of seven children.

Raymond V. Gilmartin, MBA 1968

Professor of Management Practice; Former Chairman, President, and CEO, Merck & Co. Inc.

Ray Gilmartin is Professor of Management Practice at HBS, where he is teaching Building and Sustaining Successful Enterprises, an MBA elective. He also teaches in HBS Executive Education programs, including Leading Science-Based Enterprises. He is the former chairman, president, and CEO of Merck & Co. Inc., a global, research-driven pharmaceutical company that discovers, develops, manufactures, and markets innovative vaccines and medicines.

Gilmartin joined Merck as president and CEO in June 1994 and was named to the additional position of chairman of the board in November 1994. He served in those capacities until May 2005. In July 2006, he joined the HBS faculty.

Prior to Merck, Gilmartin served as chairman, president, and CEO of Becton Dickinson, a global company that develops, manufactures, and markets medical devices and diagnostic products. He joined that company in 1976 as vice president, strategic planning, and took on positions of increasing responsibility over the next 18 years.

Gilmartin serves on the boards of General Mills Inc. and the Microsoft Corporation. He is the past chairman of the board of directors of the United Negro College Fund and has served on the HBS Board of Dean's Advisors.

An active participant in health industry affairs worldwide, Gilmartin cochairs the Presidential Advisory Council on HIV/AIDS. He is a member of the Faculty Advisory Committee of the Harvard Program for Health System Improvement, is a past chair of the Healthcare Leadership Council, and was a board member of the Alliance for Healthcare Reform. In addition, he is the past chair of the Pharmaceutical Research and Manufacturers of America and a past president of the International Federation of the Pharmaceutical Manufacturers Associations. He has also been involved in global economic and trade issues that concern the pharmaceutical industry. He was a member of the President's Export Council and is a past chair of the Council on Competitiveness. He was a member of the



Transatlantic Business Dialogue and of the Trade and Poverty Forum, a project of the German Marshall Fund.

Gilmartin received a BS in electrical engineering from Union College in 1963 and an MBA from HBS in 1968.

Frank Moss
Director, MIT Media Lab

Frank Moss is director of the Media Lab at MIT, where he serves as a professor of the practice of media arts and sciences and holds the Jerome B. Wiesner Professorship of Media Technology.

An entrepreneur and 25-year veteran of the software and computer industries, Moss has spent his career bringing innovative business technologies to market. In the last five years he has focused on how to make a broader contribution to the world by using technology to address pressing social issues—such as health care—and to improve quality of life for people worldwide.

Most recently, he cofounded and is on the board of Infinity Pharmaceuticals Inc., an early-stage cancer-drug discovery company doing innovative work at the intersection of technology and the life sciences. In addition, he chaired the advisory council for the creation of the Systems Biology Department at Harvard Medical School, where he remains an advisor.

During his career in the computer and software industries, Moss served as CEO and chairman of Tivoli Systems Inc., a pioneer in the distributed systems management field, which he took public in 1995 and subsequently merged with IBM in 1996. He cofounded several other companies, including Stellar Computer Inc., a developer of graphic supercomputers, and Bowstreet Inc., a pioneer in the emerging field of Web services.

He began his career at IBM's scientific center in Haifa, Israel, where he also taught at the Technion, Israel Institute of Technology. He later held various research and management positions at IBM's Yorktown Heights (NY) Research Center, working on advanced development projects in the areas of networking and distributed computing, and executive management positions at Apollo Computer Inc. and Lotus Development Corporation.

Moss is a member of the board of trustees of Princeton University, as well as of its advisory council for the School of Engineering and Applied Sciences.

He received a BS in aerospace and mechanical sciences from Princeton University, and both his MS and Ph.D. in aeronautics and astronautics from MIT. His citations include Ernst & Young's Entrepreneur of the Year Award and *Forbes* magazine's "Leaders for Tomorrow."

The MIT Media Lab has played a pioneering role over the last 20 years in creating the digital lifestyle we enjoy today.

Moss believes the best is yet to come: a globally connected digital society that makes people smarter, healthier, and more creative.

James D. Robinson III, MBA 1961
*Cofounder and General Partner, RRE Ventures LLC;
President, J.D. Robinson Inc.; Former Chairman and CEO,
American Express*

James Robinson is a cofounder and general partner of RRE Ventures LLC, a private IT venture investment firm based in New York. He also serves as president of J.D. Robinson Inc., a strategic consulting firm.

Robinson was chairman and CEO of American Express Company from 1977 to 1993. Earlier, he held several executive positions within American Express, was a general partner with White Weld & Co., and served as assistant to the chairman and president of Morgan Guaranty Trust Company.

Robinson is the retired and nonexecutive chairman of Bristol-Myers Squibb Company (2005–2008). He is a director of the Coca-Cola Company and Novell Inc. and serves on the boards of Visiprise, PrimeRevenue, SkyGrid, and On Deck Capital.

Robinson is a member of the Business Council, the Council on Foreign Relations, and the Committee for Economic Development. He is honorary chairman of Memorial Sloan-Kettering Cancer Center, an honorary trustee of the Brookings Institution, and chairman emeritus of the Partnership of New York City and the World Travel and Tourism Council. He was cochairman of the Business Roundtable and chairman of the Advisory Committee on Trade Policy and Negotiations.

Robinson holds an MBA from HBS and a BS from the Georgia Institute of Technology.

Willy C. Shih
Professor of Management Practice

Willy Shih is Professor of Management Practice in the Technology and Operations Management unit at HBS. He teaches in the second-year elective curriculum of the MBA Program and in the Executive Education program.

Before joining the HBS faculty in 2007, Shih spent 18 years in the computer industry, mainly at IBM, where he played a significant role in the development of the PowerPC microprocessor and systems businesses, managing engineering and developing alliances with Apple Computer and Motorola. He later managed Digital Equipment Corporation's Alpha microprocessor-based engineering workstation business and its early Windows NT and UNIX marketing operations. This was followed by a stint at Silicon Graphics Computer Systems, where he led marketing for the Advanced Systems Division and its high-end, MIPS-architecture-based, high-performance computing systems and advanced graphics systems.



From 1997 until early 2005, Shih led the creation and growth of Kodak's consumer digital business, encompassing consumer digital cameras, printers, and consumables, and its Internet-based photo services. This included the introduction of Kodak's EasyShare system, which ultimately became the top marketshare consumer digital camera system in the United States and other significant global markets. He also led the acquisition and integration of Ofoto Inc. and helped lead that to become one of the top Internet photo-sharing sites. In his last year at Kodak, Shih led the Display and Components Group, which included businesses in CCD and CMOS silicon sensors and OLED display devices and associated materials. He was simultaneously the head of corporate intellectual property strategy.

Most recently, Shih was an EVP at Thomson, based in Paris, where he was cohead of the Technology Group. He oversaw corporate research, intellectual property and licensing, and two smaller businesses.

Shih is an experienced practitioner in the field of intellectual property, having structured numerous IP licensing programs, with extensive work in license negotiations and litigation. He received a BS in chemistry and the life sciences from MIT and a Ph.D. from the University of California at Berkeley. He serves on the boards of directors of Atheros Communications Inc. and Flextronics International and is the nonexecutive chairman of QD Vision Inc.