



# Xerox Innovation

Creating the Future Today



# Welcome



Sophie Vandebroek  
Chief Technology Officer

## **Xerox researchers and business teams worldwide are delighting our customers by creating a continuing stream of product and service innovations for Xerox.**

The mission of our global research centers is to “pioneer high-impact technologies that enable us to lead in our core markets and to create future markets for Xerox”.

Xerox research is where:

- Invention and entrepreneurship are truly valued and leadership empowers you to deliver;
- We perform leading-edge research and create high-impact technologies that make a difference in the real world;
- We work with the brightest people from diverse disciplines and cultures.

Now more than ever, we are looking for ways to deliver more value to our customers and higher profits to our shareholders, while creating an environment where it is fun to explore ideas, incubate concepts and work with all our business group partners in bringing leading products and services into our customer’s hands. At Xerox we believe our continued focus on innovation allows us to do so.

## **Innovation Drives Profitable Growth**

Today’s global businesses face many challenges. Globalization trends have created new competition. The basis of competitiveness is increasingly due to the successful management of the organizations’ knowledge and intellectual capital. Value chains are being deconstructed and reconstructed in a fluid like manner. The information explosion

is fueling productivity challenges. Human endeavors are past the point of sustainability in much of the world. The status quo is not an option.

In this context of constant change, we must continue to differentiate the products and services Xerox offers to our customers. Our current focus is on technologies and methodologies that enable new services that simplify document-intensive business processes; affordable color for the office and applications for personalized printing and publishing. We also see great things ahead with our environmentally-friendly solid ink printing technology, continuing to find ways for this exciting marking technology to better serve our current customers and expand into new markets.

We have also challenged ourselves to produce technologies that disrupt the existing cost of products and services. One recent example of such an innovation is the tightly integrated parallel processing technology that we introduced in the Nuvera 288 product. Here, we exploited parallelism and redundancy to create a breakthrough cut-sheet duplex printer capable of producing 288 pages per minute. Other examples include our image services platform and our smarter document technologies which significantly improve our customers’ document intensive processes.

A key part of our role in research is to investigate ways that our core competencies and technologies can be applied to create new market spaces for Xerox. For example, where can our vast reservoir of knowledge about printing, processes, materials, imaging and smarter documents be applied? We have several research projects looking at this, including experimenting with printing materials beyond inks and toners, or looking at environment-friendly media beyond paper and exploring next-generation personalized services. The result here is innovation that has the potential for new businesses for Xerox.

In summary, Xerox is charting the course that will enable customers to continue to do great work, today, tomorrow and in the years to come. Seeing the world in new ways and successfully innovating is in our DNA. Xerox has the technology foundation and the strong roadmap for the future to continue our leadership as one of the world’s top technology innovators.

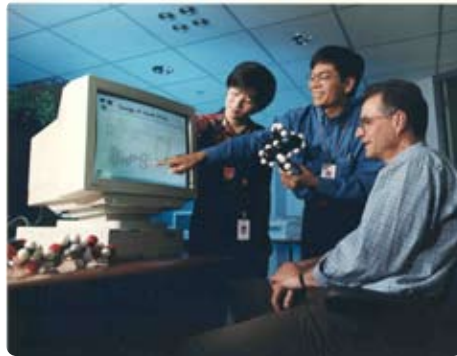
**We do our utmost to make our research vision of “being the innovation spearhead for Xerox, our customers and the world” a reality.“**



# Unique Roles of Research

## Here are a few details on the unique roles that the researchers perform.

Our global research centers are spearheading Xerox innovation. Towards that mission, the Innovation Group ensures that Xerox has the right skills and competencies for the future. It also ensures that Xerox has a balanced portfolio of research and technology projects that address the needs of today's business as well as creates options for the future. We think of our projects as having impact on three horizons - short, mid and long term - and for each type of project we play a unique role, as partners, incubators or explorers.



### Partner Projects:

Approximately 40% of our research investments directly support our business partners. Our researchers collaborate closely with the development engineers in the business groups to accelerate the up-take of new technology and platforms through a co-development model. Innovation only happens when it results in a new product or a service that hits the market and makes a difference to our customers.

### Incubator Projects:

Another 35% of our research investments is directed at creating the next generation technologies or to incubate new offering concepts. This research supports product roadmaps into the future and matures ideas to the stage where Xerox's businesses can adopt them. Research on next generation technologies includes both improvements to current technologies as well as disruptive technologies which have the potential to change the terms of competitiveness.

### Explorer Projects:

The remaining 25% of our research investments explores future opportunities and builds new insight into the potential of new technologies. Here we focus on pioneering whole new areas that can create new business opportunities for Xerox and creating the competencies for the future. To remain state-of-the-art, we are continually reskilling the organization, attracting new top-notch talent to Xerox and seeking out open innovation partnerships with the best institutions world-wide.

**To strengthen the market relevance of all of our research,** we have an explicit focus on what we call "Customer Led Innovation." Researchers frequently seek opportunities to work directly with customers and we routinely deploy ethnographic methods to learn about customer needs and pain points. Today the customer is also viewed as a partner in innovation and we encourage **"dreaming with customers"** about what the future can be like.

# Get Connected to Innovation at Xerox

## **Xerox innovation goes beyond traditional multi-disciplinary approaches bringing researchers and customers together in unique ways to solve real world problems.**

But even on the multidisciplinary front, Xerox competencies have a breadth and depth spanning the basic physical sciences, mechanical and electrical engineering, computer science, natural language, social science and even psychology.

In the modern enterprise, the only thing that is certain is change. The pace of development and adoption of new document technologies support the need to continually address productivity in an ever changing global context. The document of today is different from the document of yesterday and from tomorrow's document. Despite rapid changes, documents, especially digital documents, remain central to how we conduct business and communicate.

Aligned with Xerox's business strategy, our innovation efforts are focused on three main themes: Smarter Document Technologies; Mass Customization and Sustainability. Supporting these areas, are broad research themes and competencies that are distributed across the Xerox global research and technology centers.

## **Smart Document Technologies. For more than a half a century, Xerox has been in the business of making it easier to get work done. Our job has never been more important than it is today as the world gets even more lost in information, overloading people's ability to make sense of it all. Xerox innovations help people navigate the sea of printed and online content, cut through the clutter and make information relevant again.**

Every year, exabytes ( $10^8$ ) of information are created, stored, and distributed. Workers today spend excessive amounts of valuable time looking for information they need and often act without the benefit of critical information. At the same time, opportunities are missed to tap the unused potential of the knowledge that resides in corporate and public repositories.

Xerox research is addressing these challenges on many fronts. Our focus is on developing technologies that leverage natural language processing to analyze and extract content from documents and work process optimization and automation.

### **Document and content management**

Current document and content management systems cannot keep pace with the growing volume of information. Information retrieval no longer yields to simple search. At the same time, legacy documents, including paper documents, need to be better integrated into current business processes. At the heart of our research is the application of natural language methods to helping users find, analyze, organize and categorize information in databases, repositories and growing web information stores. By leveraging Xerox's extensive knowledge of imaging and image analysis we are extending our content management capabilities to include images and video, embedded metadata and expanding search to include the visual domain.



## Work process optimization and automation



Xerox's customer centric approach begins with work practice studies where we apply ethnographic techniques, related to sociology and anthropology, to examine how work is accomplished in the customer enterprise.

These studies build

insight into the barriers and opportunities for greater productivity and help us understand how people interact with technology. Understanding the current state is a firm step towards optimizing the customer's work processes. In the case of printshops, Xerox researchers collect data on document production operations and apply the principles of lean manufacturing, aided by simulation techniques, to recommend ways to optimize the workflow and even equipment layout, resulting in significant productivity gains and cost savings for customers. Expanding these techniques to cover a broader array of business processes is a key objective of our current research.

**Mass customization. In 2007, over 15 trillion pages were printed worldwide but less than 10% were produced on digital printers. Xerox's goal is to bring the value of mass customization to the printing market.**

Digitization is a key enabler to mass customization and results in differentiation that customer's value. Xerox's research aims to bring the value of mass customization to more applications, by addressing the cost and ease of use of digital systems.

## Modular Intelligent systems

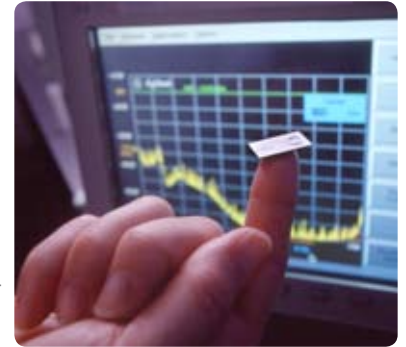
The integration of electronics and mechanical systems (mechatronics) is the industry's principal route to meeting the ever increasing demand for more performance at lower cost and in a smaller footprint. Today, embedded software systems provide intelligence at the system level and at the subsystem and component levels. New controls-centric systems designs are emerging from the confluence of sensor advances, communication, control algorithms and data mining methods. Our research aims to make systems robust, adaptive and self healing. Xerox engineers use this research to enhance device diagnostic

and prognostic capabilities as well as to add new service capabilities. One forefront area involves developing reconfigurable, reusable modules, whose functions and controls adapt to their configuration and environment.

## Breakthrough Marking Systems

While advances in xerographic technology have met the challenge of producing offset quality output, direct marking technologies and other novel marking concepts are explored today in order to achieve new breakthroughs in functionality, productivity and cost.

Today, Xerox scientists are leading in the development of Micro-Electrical Mechanical Systems (MEMS) that will fundamentally change marking systems.



## Leading Edge Imaging and Consumable Materials



Xerox, a leader in toner, solid inks and photoreceptor materials technology, is now applying its materials competencies to pioneer the application of nanotechnology. This science of building materials and devices out of elements in the nanometer-or-less size range, will lead to invention in the next generation of materials for our xerographic

systems. Toners made via chemical vs. mechanical processes are an example of the progress we have made here. By leveraging its knowledge of printing systems and organic semi-conducting materials, Xerox is a leader in the new field of printed organic electronics that expands the reach of electronics to flexible media and new devices.

# Get Connected to Innovation at Xerox

## High performance imaging

Image processing is at the heart of all printing and multifunction systems. Rendering just one high quality color page requires billions of mathematical operations to transform the image creator's intent into the instructions to drive our imaging systems. Xerox scientists continually develop new algorithms for image processing to achieve the quality and performance that customers demand. Our scientists studying color science are inventing new ways to represent and transform color images, analyze image structure and content and automatically enhance image quality at lightning speed.

## Information personalization

Personalized information is more highly valued than information created for mass consumption. The challenge for print companies is to make personalization more accessible to customers. Xerox scientists and engineers are designing the next generation of applications and interfaces that will make document



creation easy and accurate. For example, 3D visualization technology is being deployed to show the user what their final output will look like whether it's a single page or a bound book. We are also creating natural language interfaces that will allow the lay user the ability to control their output with simple natural language commands.

**Sustainability. As a leading provider of digital systems, paper, and toner, Xerox plays an important role in influencing the sustainability of our environment. Our commitment to environmental improvements extends to our partners, suppliers, and customers.**

We have challenged ourselves to invent new greener products and services as well to improve the greenness of current products and services. We aspire to incorporate "design for the environment" practices across the entire Xerox value chain.

## New Viewing Media

One approach to address the environmental impact of documents is alternative document viewing media that preserve desirable attributes of paper such as portability, thinness and low cost, while imparting the benefits of digital systems such as reuse and storage. Xerox scientists are working on new concepts for reusable paper and with organic electronic materials to enable very low cost flexible displays.

## Green Services

With the increasing awareness of the environmental impact of one's operations, customers are interested in how they can measure and improve this impact. As part of our broadening service offerings we are now developing services that address sustainability. For example, Xerox provides a service that optimizes for underutilized assets, energy inefficiency, wasted manufacturing and materials, and inefficient maintenance. By building quantitative models of the impact of each process in the enterprise, we can assess the impact of changes in business processes on many green dimensions (energy, paper, waste, transportation, etc). We are also developing personal assessment calculators that let individuals look at their own environmental impact.



# Xerox Global Research Centers



**Xerox innovation brings together many disciplines and technical competencies.** Xerox is unique in this respect in that its research has spanned everything from basic physical sciences, mechanical and electrical engineering through to social science and psychology. Xerox's research and technology centers around the world each provide their own unique perspective.

## Xerox Research Centre of Canada

XRCC is Xerox's materials research center, enabling the flow of leading-edge imaging and consumable materials from research concepts to supplies solutions. Founded in 1974, XRCC leverages its core competencies in materials design, synthesis, characterization, evaluation and scale-up to deliver -- with partners -- environmentally sound materials and processes that support higher-quality and lower-cost color and monochrome products for both office and production markets.

Specifically, XRCC conducts fundamental and applied materials research in toners, inks, photoreceptors and specialty substrates to support xerographic and direct marking technologies. An example of its breakthrough research is a chemical toner called "Emulsion Aggregation (EA) Technology," which uses nanotechnology methodology and yields sharper image quality, higher reliability, reduced toner usage, faster warm-up time and environmentally friendly manufacturing process.

Research in organic electronic materials in the areas of digital document media, displays, and printed organic electronic consumables is also being carried out to bridge the gap between paper and electronic documents. This research is also focused on applications of nanotechnology.

## Xerox Research Centre Europe

Xerox established its European research center in France in the early 90's to create innovative document technology and drive the corporate transition in becoming a services-led technology business. The center coordinates research, engineering and the Technology Showroom, a customer showcase for Xerox research and a technology exchange forum.

The center also develops connections within the wider European scientific community through collaborative projects and partnerships.

XRCE focuses its research in text and image content processing, document transformations, data mining and the study and understanding of work practices.

Technology applications are developed which streamline document intensive processes, bridge the paper and digital worlds and ease the task of information management in multiple languages. The centre is at the heart of many of the components in Xerox's 'Smarter Document Management' suite such as text and image categorization, XML document conversion and linguistic analysis tools. The center's research expertise includes natural language processing, machine learning, XML, computer vision, computer science, mathematics, datamining and ethnography.



### **Xerox Research Center Webster**

The Xerox Research Center Webster has a broad charter to explore, incubate and innovate across the spectrum of devices, solutions and services. Internationally recognized for pioneering work in xerography, these labs were founded in 1960 and have provided the technical foundation and intellectual property protection for four generations of Xerox marking engines. More recently, the XRCW has expanded its charter to encompass an integrated, end-to-end view of Xerox products, solutions and services technologies in collaboration with value-chain partners throughout the company.

In Xerox Research Center Webster labs, world-class scientists investigate systems integration and design, solid ink technology, the control of complex imaging and printing systems, and the architectures and systems for advanced digital imaging and workflow technologies. Its researchers lead the drive to provide Xerox customers with affordable color products and with services and solutions that help them both simplify and get more value from their document-intensive business processes.

### **Palo Alto Research Center**

PARC is a wholly owned subsidiary of Xerox Corporation and an integral part of Xerox's strategy for long-term research investment. Founded in 1970 as a part of Xerox Research, PARC was incorporated in 2002 as an independent research business.

As the birthplace of technologies such as laser printing, Ethernet, the graphical user interface, and ubiquitous computing, PARC has an established track record for transforming industries and creating commercial value. PARC has delivered lasting value to Xerox, for example, as laser printing became a multibillion-dollar business for Xerox. PARC also was the birthplace of Xerox's DocuPrint network printing software, the dual-beam lasers used in many Xerox products, and the scheduling software of the Xerox DocuColor iGen3 Digital Production Press.

Xerox continues to embed relevant PARC technology into its product and solutions offerings. PARC is also delivering its innovations to a wider range of non-competitive industry partners than ever before. Together, PARC and Xerox are defining a new vision for how pioneering research creates commercial impact. Current research includes diverse areas such as biomedical systems and bioinformatics, cleantech, enterprise and collective knowledge systems, ethnography, human information interaction / HCI, intelligent control and autonomous systems, intelligent image recognition, large-area electronics, MEMS, microfluidics, and novel materials, natural language processing, ad-hoc and sensor networking, optoelectronics and optical systems, security and privacy, and ubiquitous computing.

# Diversity in Research

**One of the fundamental strengths of the Xerox Innovation Group is the diversity of our people.**

XIG benefits in a variety of ways from diversity in gender, culture, age, race, sexual orientation, physical ability, education, work style, and thought:

- Diversity of perspective and experience are required for creativity and innovation, which are at the heart of our organizational mission.
- Diverse people bring different and complementary leadership styles to the organization.
- An inclusive organizational culture contributes to employee satisfaction.
- The users of our technology and our customers are themselves a diverse group. Our own diversity helps us understand and address their business need.

Diversity doesn't happen by accident. There is a natural tendency to support and perpetuate the familiar. Increasing diversity requires attention and commitment. XIG managers have a key role in making decisions that support and increase diversity. But every XIG employee has a role in creating an environment that welcomes and supports the diversity of their fellow employees.



“Diversity is about more than race and gender; it’s about more than numbers. It’s about inclusion.

Diversity means creating an environment where all employees can grow to their fullest potential.”

**Anne Mulcahy, Chairman, Xerox Corporation**

# Innovation in the Community

## From our earliest days as a company, Xerox has been shaping the idea of Corporate Social Responsibility.

Through the Xerox Foundation, our education and social service efforts are an extension of our belief that a successful corporation must be an active participant in society.

Today, the Xerox Foundation is the hand that gives something back to the communities from which we draw our employees, our customers and our freedom to conduct business. The following are several initiatives within the R&D community that receive support from the Foundation.

**University Affairs Committee** - The University Affairs Committee (UAC) awards unrestricted grants to selected universities to support collaborative projects sponsored by Xerox employees. The grants promote long-term university interactions that encourage foundation research in areas relevant to Xerox, enhance Xerox's recruiting efforts, and help keep Xerox abreast of emerging technologies. Approximately forty new or renewal grants are paid each year, with funding provided by the Xerox Foundation.

Any Xerox employee is eligible to sponsor a grant. Grants are awarded by the UAC through competitive evaluation of proposals according to technical merit, relevance to Xerox, quality of the university and faculty, and commitment of the proposing employee. Awards are typically about \$20K per year, and may be renewed for up to a total of three years.

**Xerox Technical Minority Scholarship Program** - The Xerox Technical Minority Scholarship Program, funded by The Xerox Foundation, was developed to demonstrate Xerox's strong commitment to the academic success of minority students and to the cultivation of qualified minority employees in technical fields.

The scholarship program began in 1987; since then, more than 1,400 students have benefited from almost \$2 million in funding.

Scholarships are made available to minority students

enrolled in technical degree programs at the bachelor's degree level or above. Eligible students must have a grade point average of 3.0 or higher and show financial need. Students are allowed to reapply for the scholarship on an annual basis.

**The Xerox Science Consultant Program** - This is partnership with the Rochester, N.Y. City, and Webster N.Y. Suburban School districts -- sends Xerox engineers and scientists into elementary schools twice a month to engage young learners in biology, chemistry, earth science, physics and other scientific disciplines. Begun in 1968, the program is marking its 40<sup>th</sup> anniversary this year.

**The FIRST program** - An acronym for "For Inspiration and Recognition of Science and Technology" -- is an international competition that teams professionals and high school-level students in an effort to solve engineering design problems through robotics. Xerox-sponsored teams have competed in Monroe County N.Y. since 1992 when FIRST was founded.

**PRIS<sup>2</sup>M** - PRIS<sup>2</sup>M is a Rochester Business Alliance initiative that offers opportunities for minority students to experience math, science and technology enrichment through visits to work sites and colleges, scholarships as well as participation in cross-team competitions and workshops. During the academic year, PRIS<sup>2</sup>M students participate in activities designed to increase their interest in math, science and technology; develop their leadership potential, organization, and communications skills, and enhance their academic preparation with math and science experiences outside of the classroom. Xerox is a corporate contributor to PRIS<sup>2</sup>M.



# Innovation Contacts

[www.xerox.com/innovation](http://www.xerox.com/innovation)

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