Innovation Spotlight Report: The Evolution of PARC

July 2021

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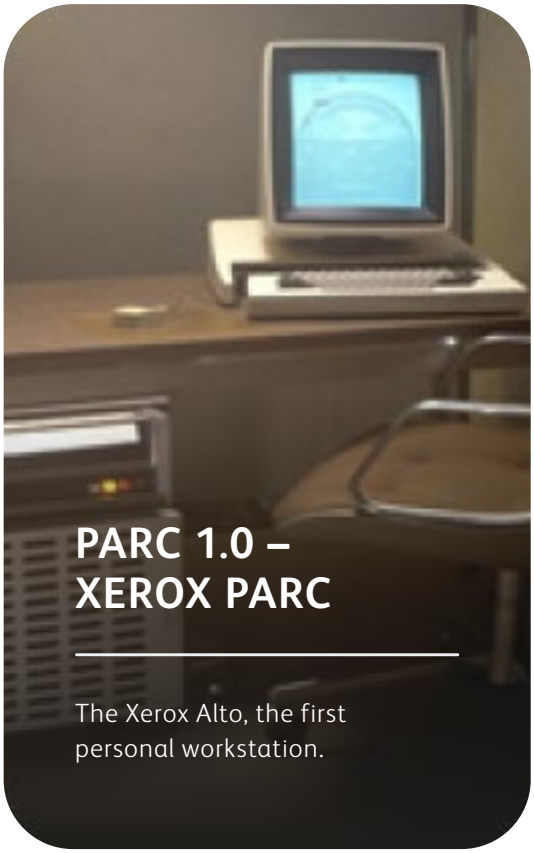
The Evolution of PARC

This is the first in a series of Innovation Spotlight Reports that will provide a deep dive into our research and development (R&D) activities to create disruptive technologies in software, augmented reality, artificial intelligence, additive manufacturing, industrial Internet of things (IoT), and cleantech. These reports will highlight specific innovation pillars as well as potential products, focus areas, technologies, opportunities, applications and total addressable markets (TAMs).

In this inaugural report, we provide a brief history of the Palo Alto Research Center (PARC) – our primary innovation hub that's one of many R&D facilities – and its evolution.

Throughout its more than 50-year history, PARC's mission has been to create and launch high-impact, breakaway businesses powered by disruptive technologies. PARC's research staff of more than 200 includes some of the most talented, creative and entrepreneurial Ph.D.–level scientists and engineers in the world – people with the technical expertise, business sense and drive to turn breakthrough science into commercially viable solutions. We are confident that this world-renowned research facility, when combined with our focus to bring solutions to market and scale new ventures, will lead to material revenue generation and significant long-term value creation for all Xerox stakeholders.



PARC 1.0 – XEROX PARC

The Xerox Alto, the first personal workstation.

Founded in 1970 in Silicon Valley, PARC's charter was to create "The Office of the Future." By all accounts, PARC successfully delivered on its mission in its first 10 years—inventing multiple office technologies that we still use today, including the laser printer, Ethernet networking protocols, the first personal workstation known as the Xerox Alto, the graphical user interface, and What-You-See-Is-What-You-Get word processing.

In the 1980s and 1990s, PARC continued its drumbeat of innovations, including optical storage, fiber-optic networking, thin-film transistors and sensors for flat-panel displays and digital x-ray systems, solid-state lasers, multi-beam lasers and software technologies such as natural language processing, ubiquitous computing, information visualization and web conferencing.

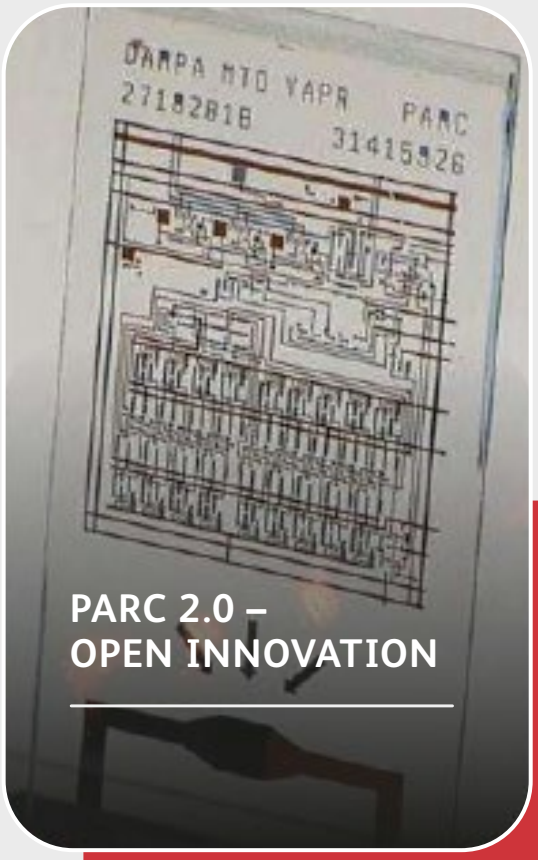
A collaborative culture attracted premier scientists and engineers who shared a deep expertise in their technical field and broad interest and curiosity across many areas. PARC created multi-disciplinary teams across physical sciences, computer science, and social science, which enabled researchers to see problems from new perspectives, envision a different type of future, and develop breakthrough solutions before others.

As PARC researcher Alan Kay famously said in 1971, "The best way to predict the future is to invent it." Ultimately, PARC researchers were driven to solve problems that improved the world at scale, inspiring and leading the formation of new industries now worth trillions of dollars.

In 2002, Xerox spun out “PARC, A Xerox Company” as a wholly owned subsidiary offering research services and licensing intellectual property (IP) to clients around the world, including government agencies, global enterprises, and startups. In 2003, PARC joined the “Open Innovation” industry, forming partnerships to expand growth opportunities. This approach gave PARC access to new areas of research and innovation via collaborations that not only provided additional funding but also reduced risks and instilled operational discipline in delivering value to clients.

The new business model changed PARC from a captive industrial research center into a business with revenue and profit responsibilities.

As word spread about this new Open Innovation model, PARC attracted a new generation of creative, entrepreneurial scientists to work on the toughest, most valuable technical challenges in the world. Government funding through agencies such as the Defense Advanced Research Projects Agency (DARPA) and the Advanced Research Projects Agency – Energy (ARPA-E) was especially valuable because it enabled PARC to work on high-risk, early-stage technologies and retain the rights to commercialize those technologies and IP.



PARC 2.0 – OPEN INNOVATION

Disappearing Chip: PARC’s Disintegration Upon Stress Release Trigger technology used under DARPA’s Vanishing Programmable Resources program.

PARC 3.0 – RESEARCH DRIVEN VENTURE STUDIO

Since Xerox Vice Chairman and CEO John Visentin took the helm at Xerox three years ago, PARC has entered another period of transformation. Today, PARC's focus has evolved to pull the thread of innovation beyond research to full product development and new business creation.

No longer viewing PARC as just a research center, PARC and other global Xerox R&D centers are now an integrated part of a larger Xerox innovation business unit. This unit operates as an end-to-end venture studio to incubate and launch new businesses enabled by commercial ready breakthrough technologies, supported by global leaders to improve product-market fit and accelerate market entry across the value chain and ecosystem.

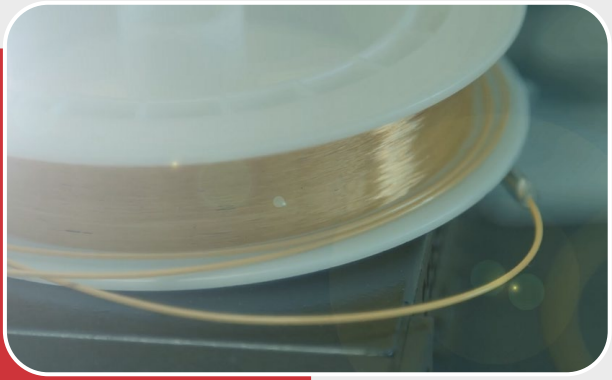
PARC Business Model

The research function applies Xerox R&D investment and Open Innovation engagements to fill the front end of the innovation funnel with new technologies that solve major problems, while the venture studio function defines Minimal Viable Products (MVPs) from promising technology options and validates problem-solution fit and product-market fit with lead customers. The business teams create and run internal startups to develop products to launch, after which they become operating businesses with the right mix of experienced leaders and go-to-market channels to scale.

The new businesses already launched or in incubation, leverage PARC's strengths that have been developed over decades. These strengths include, but are not limited to:

- Hybrid AI that combines model-based reasoning and machine learning to deliver highly accurate diagnosis, prognostics, and intelligent systems;
- Microsystems and optoelectronics that enable low-cost, compact sensing and monitoring devices in the field;
- Geometric and spatial reasoning that enable automated 3D design simulation and validation; and
- Electrochemical energy systems that deliver greater energy efficiency and lower greenhouse gas emissions.

The Xerox ElemX™ Liquid Metal Printer



Spool of sensing fiber designed at PARC

Design rendering of the Xerox HVAC Dehumidifier

Sample Near-Term Focus Areas

- Additive Manufacturing (3D Printing): With the launch of the Xerox ElemX™ Liquid Metal Printer, we aim to improve supply chain resiliency through on-demand, local production of end-use parts. This breakthrough technology uses off-the-shelf metal wire that is safer and more cost effective and requires less post processing than metal powders, the predominant material used in metal 3D printing today.

  Extending beyond prototyping, this fast-production tech has a large TAM covering aerospace, contract manufacturing, heavy equipment, and automotive. *[$13B TAM with a 13% CAGR (2020-2026)].*[1]

- Industrial IoT: In May, Xerox launched Eloque™, a joint venture between Xerox and the Victorian Government (AUS) to deploy fiber optic sensors developed at PARC to monitor aging infrastructure assets, starting with bridges. We developed this solution to help solve the global problem of aging and deteriorating critical infrastructure. Around the world, there are 1.8 million bridges that are more than 50 years old. Eloque has the potential to prevent catastrophe and provide significant cost savings and efficiencies for infrastructure asset managers. *[$16B TAM with a 23% CAGR (2020-2026)].*[2]

  Other IoT investments are targeted at industrial predictive maintenance and geospatial sensing.

- Cleantech: Climate change and an increasing focus on Environmental, Social, and Corporate Governance (ESG) has propelled cleantech to an important investment area at PARC. Currently greenhouse gas emissions from air conditioning are greater than emissions from all air travel combined. Our primary focus to-date has been on HVAC and developing dehumidification technology that could improve energy efficiency up to 80 percent, reduce greenhouse gas emissions and improve indoor air quality. *[$75B TAM with a 6% CAGR (2020-2027)].*[3]

We are at an inflection point for both Xerox and PARC. After years of experimentation and learning as an Open Innovation business, PARC now plays a central role as we work to stand up our innovation business as a separate unit under the PARC name. This new business unit will include the scientists and engineers located in Palo Alto, Calif.; Webster, N.Y.; Cary, N.C., and Toronto and will drive the commercialization of our disruptive technologies. Stay tuned.

Sources:

1. Wohlers Report, 2021 and "3D Printing 2019-2029 Technology and Market Analysis Report," IDTechEx, 2019

2. "Predictive Maintenance Market Report 2021-2026," IoT Analytics, 2021

3. Xerox data

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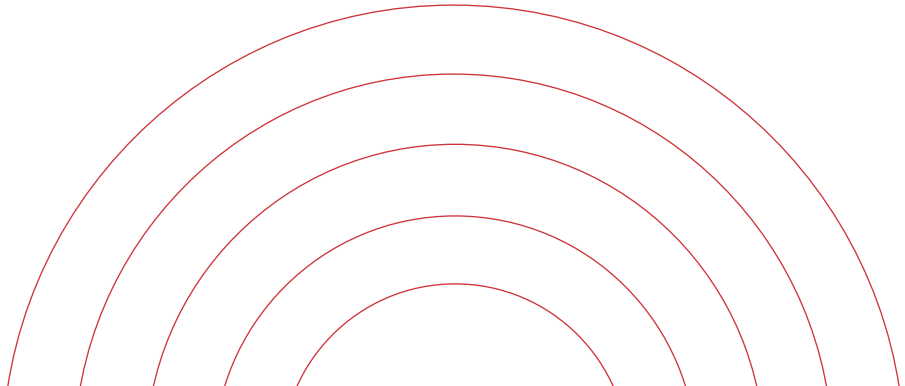

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