



Nervous System: The Bakery Computer

BY DAVID KALAT

With the aggressive pace of technological change and the onslaught of news regarding data breaches, cyber-attacks, and technological threats to privacy and security, it is easy to assume these are fundamentally new threats. The pace of technological change is slower than it feels, and many seemingly new categories of threats have been with us longer than we remember.

Nervous System is a monthly series that approaches issues of data privacy and cyber security from the context of history—to look to the past for clues about how to interpret the present and prepare for the future.

A heated and consequential debate revolves around the ethical and legal responsibilities governing social media platforms like Twitter, Facebook, and YouTube. These and other tech giants have risen to enormous power and influence while serving as broadcast media for a range of controversial and disputed content. Counterintuitively, the broad legal protections that tech companies enjoy derive from a law that was intended to encourage them to exercise significant content moderation. In many ways the present moment is the exact opposite result of what the law set out to achieve.

In the aftermath of the Second World War, the makers of computer systems had to pivot from selling them to the government as a critical component of wartime national defense to selling them commercially to business owners to help advance profits. It may come as a surprise that the first business to purchase and install computers for civilian use

was a bakery. J. Lyons & Co. however was keen to install the “Lyons Electronic Office” to take advantage of the new information age. Compared to other businesses, bakeries have acute supply chain and inventory challenges. Their products have exceedingly short shelf lives, and the choice of when to convert shelf-stable flour and water into fresh-baked breads and pastries that need to be sold and consumed the same day calls for complex real-time data analysis.

J. Lyons and Co. operated a popular chain of nationwide teashops across the United Kingdom. These locations were open twenty-four hours a day and experienced significant foot traffic and patronage.

Whereas tea was made to order using dried leaves that had a long stable shelf life, the pastries that accompanied them were perishables that needed to be consumed within a day of baking. If Lyons made too few, they would lose potential sales; if they made too many, they would waste ingredients and labor. Each cake was a low-cost, low-profit item, but at scale across the many Lyons locations the choices about supply chain management would be critical. Dialing in inventory and production to maximize sales and minimize losses was fundamentally a data problem.

To this end, Lyons had developed highly sophisticated business analytics, crunched by armies of accountants, that were fables throughout the business world. Senior managers at Lyons had been monitoring the development of computer technology with the ambition of bringing such tools into their operations. In fact, the company was so hungry for computer technology they were unwilling to wait for it to arrive in the marketplace on its own.

In 1947, the company contacted the team at the University of Cambridge responsible building the Electronic Delay Storage Automatic Calculator (EDSAC). Lyons manager David Caminer wanted to build a replica of the EDSAC. To this end, Cambridge's engineers connected Caminer to researcher John Pinkerton. Pinkerton joined Lyons as the project's chief engineer. It was a life-changing decision.

Pinkerton later quipped that he did not want to change any aspect of the EDSAC's design he did not fully understand, and therefore he did not change it at all. Jokes aside, Pinkerton did significantly refine the design to resolve some of the bugs that plagued the EDSAC team. The bakery's computer was no mere research boondoggle, it needed to serve the demands of a major British business institution. The computer Pinkerton built would prove to be substantially more reliable than the EDSAC he copied.

The Lyons Electronic Office, or LEO, boasted was then an impressive memory of 8.75 KB, made from sixty-four 5-foot mercury tubes (each of which weighed in at a half ton). It used a set of 6,000 vacuum tubes to perform calculations. Pinkerton's engineers could tell if the machine needed maintenance by simply listening to its wail of buzzing and noise.

In addition to being the first computer used for non-military or governmental purposes, the LEO also ran the first commercial office software. Lyons' "Bakery Valuations" was a computerized version of its sophisticated analytics, to predict the right amount of tea cakes to make each day. Caminer set up a daily telephone link between the local shops to the central office to report their day's sales. As a 1950s precursor to an internet connection, this

daily telephone update fed the LEO real-time information by which to update trend reporting and predictive analytics. LEO crunched those numbers and output a list of goods needed for each shop individually. Those goods would be loaded onto vans and delivered the following morning.

The LEO went into operating in early 1951. Within just three years, Lyons decided they needed more. Pinkerton realized he had a bigger task ahead than just making a second (or a third) LEO. Other businesses had heard of the machine and wanted their own. Ford Motor Company was asking if they could buy one.

At this point it became clear that building computers required resources and expertise *different* from the resources and expertise needed to run a thriving tea business. To meet the growing demand, Lyons set up a dedicated subsidiary to focus on making computers. Pinkerton became technical director of the new company, LEO Computers Ltd., and oversaw the development of the next generation of LEO machines.

Over the coming decade, the rise of transistors started to revolutionize the computer hardware business. The LEO III incorporated transistors, but the company knew that keeping apace with the industry would require new investments in research and development. Worried about rising costs and risks, Lyons opted to sell LEO Computers to English Electric Computers in 1961. Pinkerton went with his machines, and became English Electric's head of research. In 1968, the UK's Ministry of Technology forcibly merged English Electric merged with its rivals to create ICL. For the rest of his career, Pinkerton was tasked with advising ICL on how to remain competitive against IBM and the American computer industry.

Pinkerton retired in 1984, as the computer industry underwent yet another convulsive transformation away from large business mainframes toward mini-computers sold for home use.

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