

A Note on LEO's Place in Computer Development:

Brian R Harrington

A synopsis of digital computer development during the period in which J. Lyons considered building LEO. The position of LEO in the timeline of computer development worldwide.

Some examples of a time-line for computers developed worldwide around the 1950's and their applications are.:

<https://www.computinghistory.org.uk/cgi/computing-timeline.pl>

<https://archivesit.org.uk/themes-and-topics/the-history-of-it-timeline/>

ENIAC was the first programmable, electronic, general-purpose digital computer. It was Turing-complete and able to solve a large class of **numerical problems**. The military used ENIAC for a large class of numerical computations such as hydrogen bomb design, ballistics, and weather forecasting. However, ENIAC could not store programs and had to be re-configured for each job. That is, mechanical and electro-mechanical circuit changes were needed.

The U.S. military commission for ENIAC (Electronic Numerical Integrator and Computer) began on May 31, 1943. However, the machine wasn't introduced officially until November 1945, when the war had ended.

From ENIAC, Eckert and Mauchly started work on a new design, to be later called the **EDVAC (Electronic Discrete Variable Automatic Computer)** which would be both simpler and more powerful. The main enhancement to EDVAC design embodied the "stored-program" concept that we now call the **Von Neumann architecture**, dated 1945. This was the storing of the program in the same memory as the data. Unlike ENIAC, EDVAC was binary rather than decimal.

The British computer **EDSAC** (Electronic Delay Storage Automatic Calculator) constructed by **Maurice Wilkes** and his team at the University of Cambridge Mathematical Laboratory in England at Cambridge (and the **Manchester Baby**) used this architecture.

The EDSAC was the first modern electronic computer to "go into service". The Manchester Small Scale Experimental Machine ("Baby") was demonstrated the year before EDSAC first ran a program, but Baby was only conceived of as a testbed for the Williams Tube memory technology and was never put to useful work – it became the basis for the Manchester/Ferranti Mk 1, delivered to Manchester University in 1951.

The Cambridge EDSAC had a programming system based on an extensive library of subroutines for mathematical functions, input and output, debugging aids including postmortem reports and program tracing, EDSAC provided general computation and

practical support for mathematical and scientific calculations such as cosmic-ray investigations, thermal ignition, random-number studies, and wind tunnel design.

LEO 1 followed these general principles, but was designed to process commercial and manufacturing data, and to follow the business processes of a large and complex commercial organisation. Importantly, LEO 1 embodied the "stored-program" concept.

LEO was more than a United Kingdom achievement. LEO was the first business computer in the world. IBM has "business computers" before the **System/360**. For example, the System 650, described on IBM's history web site as "the workhorse of commercial computing", but as it was only announced in 1953, it post-dates LEO. This appears to confirm that in the field of applying digital computing to business processes for a large commercial company, LEO was ahead of the progress in commercial data processing in the U.S., and elsewhere.



IBM's breakthrough came in the 1960's with its **System/360** family of mainframe computers. IBM introduced its first computer a year after **Remington Rand's UNIVAC** was first delivered in 1951. The IBM 701 was introduced in 1952. In 1951 LEO I was already commissioned and running bakery applications for the Lyons business.

Other first-generation computers are oriented towards scientific computing. Of note are:

CSIRAC (**C**ommonwealth **S**cientific and **I**ndustrial **R**esearch **A**utomatic **C**omputer), originally known as **CSIR Mk 1**, was Australia's first digital computer, and the fifth stored program computer in the world. It is the oldest surviving **first-generation electronic computer**, and was the first in the world to play **digital music** (the **Zuse Z4** at the **Deutsches Museum** is older, but was **electro-mechanical**, not **electronic**).

The **Z4** was finished and delivered to the ETH (Federal Institute of Technology) in Zurich, Switzerland, in 1950. At that time, it was the only working digital computer in Central Europe, and the second computer in the world to be sold or loaned, beaten only by the **BINAC**. The **Z22**, the first computer with a memory based on magnetic storage.

Other developments included the MESH (Russia), BARK (Sweden), SAPO (Czechoslovakia), Odra (Poland), that were either electro-mechanical or were not delivered until late 1950's or later.

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