Calculating machines

Nina Wormbs

MECHANICAL CALCULATING MACHINE in wood and brass, made in Stockholm in the 1870s.

For centuries, perhaps even millennia, people have attempted to improve instruments that help with various types of calculations. Over time, trade, bureaucracy and science have handled increasing amounts of numeric data that must be divided, multiplied, added and subtracted, and there has long been a desire to make this work more efficient. One way has been to educate a workforce to perform these monotonous calculations. Another way, often combined with the previous one, has been to construct machines that can do the work.

We now see part of this development as the prehistory of computers. In a time that many people regard as being a transitional period – even if it is quite a long one at this point – it appears important to understand what came before. One particular field in the history of technology is dedicated to creating the family trees of various constructions that preceded and could presage later machines. There has been great emphasis on the machines that were first in each phase, a classically innovation-focused and now fairly criticised way of studying the history of technology. Instead, if we look at the things that were most used, an entirely different picture takes shape.

Among the apparatus, automata and calculating machines, some have taken a greater place than others in this genealogical ambition. For example, Herman Hollerith's punched card tabulators to facilitate the US censuses at the turn of the last century were the origin of the IBM company, which has long been influential and which, in the 1960s, completely dominated the world computer market, not least as an organisational aid in public administration.

Charles Babbage's difference engine was not a success, but is still famous; he developed it theoretically in the 1830s, although he never managed to build it. Instead, two decades later, father and son Scheutz from Stockholm

were the ones who built and sold two "Scheutzian calculation engines", impressing both Faraday and Babbage himself at the Royal Society in London. However, they seldom appear in the annals of history. One of their machines was sold to Dudley Observatory in New York in 1857, but the machine was not used frequently and was soon forgotten. Technology historian Michael Lindgren has reasoned that this was because the need for machine calculation was less than previously believed, that the machine was complicated to use and that few institutions could handle the new technology. The technically successful Scheutzian calculation engine was thus a commercial failure.

Against this background, a science fiction and steampunk novel from 1990, *The Difference Engine* by William Gibson and Bruce Sterling, makes fascinating reading. Gibson is probably better known for his novels in the cyberpunk genre and for coining the word cyberspace. The novel's premise is counterfactual: what if Babbage had succeeded and we had had a steam-powered computing revolution, with the national statistics agency as the powerful social institution that supported this technology? This is the book's context. The fact that such machines were built and worked demonstrates that more than one or two machines are necessary to create a revolution.

Nor was the machine in the picture to the right revolutionary. Economics historian Tom Petersson believes that these office machines, or pinwheel calculators, were not generally characterised by particularly rapid technological change. Mechanical machines were still being manufactured in the 1970s, despite the first electrical ones appearing in the early 20th century.

This machine is a Facit Adding Calculator Model E. Where it was located is unknown, but it was probably purchased for the observatory in Saltsjöbaden, even if no documentation for this has been found. This was Facit's first electrical calculating machine, launched in 1934. In the 1930s, the company developed another two variants. A clear difference from the earlier mechanical calculating machines – such as the T type – was that there was no crank on the side. The advantages were that there was no need to turn the crank and, most of all, no need to remember how many turns had been made for a specific calculation. Of course, the disadvantage was that it required electrical power, and it was possibly a little louder; Per Olof Lindblad, who worked at the observatory, remembers it being called the "the shrew". The position of the 4 on this machine is also somewhat of a mystery, but an ocular inspection shows that it has simply jammed and that power is required to get the mechanics in order. The feature that was originally exceptional and new about the machine, namely that it was electrical, proved to be a drawback once it came to the archive.

The two-row keyboard was of the Dalton type, invented at the start of the 20th century. Calculating machines had previously had keys for all the figures in every position in a number – ten keys for ones, ten for tens, and so on –

ELECTRICAL CALCULATING MACHINE launched by Facit in 1934.

and, accordingly, they were covered with keys. The Facit machine appears to be a comparatively modern device, simple and tastefully defined, without the polished brass and the beautiful wood we have learned to appreciate on instruments from the 18th and 19th centuries.

Still, wood was not far removed. The company that produced the Facit machines was called Åtvidabergs industrier; it had originally focused on office furniture and wooden décor. In the 1920s, the machines were one way of diversifying its activities. Agreements were signed with international typewriter manufacturers, such as Royal Standard and Corona, as well as with Brunsviga, which manufactured the Odhner machines on licence. Willgodt Odhner was, in Tom Petersson's words, a pioneer who had manufactured calculating machines since the 1880s, mainly in Saint Petersburg, but who was forced to move back to Gothenburg due to the revolution. Åtvidabergs industrier also cultivated a partnership with the company Facit AB, which they then acquired.

The price of parquet flooring fluctuated wildly in the 1920s and, after an attempt to form a cartel had failed, linoleum flooring expanded at wood's expense. Other wooden products also felt the squeeze, with wooden cabinets feeling the competition from metal cabinets. Office machines therefore

gradually became Åtvidabergs industrier's primary product and the company grew from about 500 employees at the start of the 1920s to almost ten times as many in the mid-1950s. The group was then the second-largest manufacturer of office machines, behind the Italian company Olivetti.

However, in parallel with this expansion, the development of what we now call mainframe computers was underway. The Swedish Board for Computing Machinery was established in 1948 and tasked with developing Swedish machines; first, a relay computer was built, Bark (1950), and then an electronic one, Besk (1953). Saab built the electronic Sara (1957) and other companies and universities also made their own attempts. Facit recruited several of the members of the Board, but without success. Investments in mainframe computers were discontinued in the 1960s; the state withdrew from development work and the Board for Computing Machinery was wound down. Attempts to cooperate with major international businesses were thwarted and, when small electronic mini-calculators arrived in the 1970s, things went downhill fast. In 1973, Facit was sold to Electrolux, which discontinued the manufacture of the old calculating machines in 1975.

The story of Facit is usually described as one of a rise and fall. Facit was unable to keep up with its competitors and was overtaken. There are many competition metaphors suitable for the growing understanding of computing's development as being extremely rapid. The company's management was criticised for simply not understanding the technological changes that were occurring. From another perspective, one could state that this former furniture manufacturer from the Swedish province of Östergötland had, for many decades, played an important role in providing companies and scientific institutions with reliable pinwheels that simplified and facilitated their work.

Unfortunately, like today's computers, these calculating machines were unable to offer help of the type we perhaps all sometimes wish for. According to Babbage, he was asked: "Pray, Mr. Babbage, if you put into the machine wrong figures, will the right answers come out?" The answer must still be no.

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Tom Petersson has told the story of Facit in, among others, *Fadern, sonen och det heliga företaget: När Åtvidaberg och Facit erövrade världen – och hur de förlorade den* (Möklinta, 2012). Michael Lindgren's book is called *Glory and Failure: The Difference Engines of Johann Müller, Charles Babbage, and Georg and Edvard Scheutz* (Cambridge, 1990). There are many general descriptions of the development of calculating machines, see for example Jörgen Lund, *Från kula till data* (Stockholm, 1989), or Ernst Martin, *Die Rechenmaschinen* from 1925, translated and published as *The Calculating Machines: Their History and Development* (Cambridge, 1992).