

Maarten Bullynck, Computers as Boolean machines: Between operational clarity and physical reality.

The building of digital computers relied on relay and vacuum tube technology in the 1940s and later switched to semiconductor technology in the 1950s. In engineering the logic of digital computers, the practices, developed for relay and tube switching, had to be used, recycled and rethought. One of these practices was the use of Boolean logic to simplify switching circuits, pioneered at Bell Labs by C.E. Shannon. This technique only had a limited application range, in particular, Boolean logic did not help to integrate various simple circuits into a complex machine. Around 1950, design teams all over the U.S. tried their hands at developing general design principles for a digital computer, but in most cases, Boolean logic was only an auxiliary technique. This changed with the advent of transistor technology. Boolean logic turned out to be quite a perfect compromise between clearly describing the operational structure of a computer on the one hand, and covering up the details of the underlying semiconductor physics on the other hand.